# Bell Telephone MAGAZINE

SUMMER 1959

*Educational television presents challenging opportunities for telephone companies in a new communications field.*

VOLUME XXXVIII NUMBER TWO SUMMER 1959

# Bell Telephone Magazine

*A non-technical review, published quarterly to give Bell System management people a broader view of the history, objectives, operations, and achievements of this business than they might attain in the course of their day-to-day occupations, and an added sense of participation in the problems and accomplishments of our nation-wide public service.*

COVER: "Educational television presents challenging opportunities for telephone companies in a new communications field." Painted for this issue by *Charles Mazoujian*


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A MEDIUM OF SUGGESTION and A RECORD OF PROGRESS

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# Who's Who & What's What In This Issue

*William D. Bulloch*

THE AUTHOR of this issue's "Rockets, The Bell System, and the Future," served in the navy as a pilot and flight instructor during World War II. Following the war, WILLIAM D. BULLOCH taught mathematics, physics and astronomy at the University of North Carolina where he received an M.S. degree in physics. While working toward his Ph.D. at the same school, he was active in writing and delivering many of the presentations at the University's Morehead Planetarium. Before completing the work for a doctorate in physics, Mr. Bulloch joined Bell Telephone Laboratories in 1952 as a technical editor of the *Bell Laboratories Record*. Later, he became associate editor of the *Record* and in 1956, editor. The following year he was named editor of the *Bell System Technical Journal*. At the same time he was supervisor of a newly formed group responsible for the production of visual aids. In this capacity, he helped develop the Labs program of films and film strips designed as direct teaching aids for use in college classrooms. Mr. Bulloch, who has been with the American Telephone and Telegraph Company as public information supervisor since December, 1958, is responsible for helping coordinate Bell System public relations work with science and defense themes.

THE ARTICLE on educational television is CALDWELL BUCK's first contribution to this MAGAZINE. Mr. Buck, who joined the Southwestern Bell Telephone Company as a student engineer in 1927, worked in the Commercial Department before he became an economics instructor at Lehigh University. In June 1930, he joined the rate

*Caldwell Buck*

section of the American Telephone and Telegraph Company. He headed groups in the rate section as well as in Administration M before going to sales and servicing in 1950. Since 1951 Mr. Buck has been staff engineer in the Business Relations Department. Aside from an understandable nostalgia for educational matters, his interest in ETV stems from a special assignment to work with nation-wide organizations active in this new communications field.

*John C. Swartley*

ENTERING the Bell System in June, 1924, JOHN C. SWARTLEY was with the Long Lines Commercial Department until 1929. From then until 1940 he was in the rate section of the Operation and Engineering Department. In 1940 he returned to Long Lines and was general commercial engineer before going on military leave. He was a major, then lieutenant colonel, in the General Staff Corps, Production Division, Headquarters A.S.F. In 1945 Mr. Swartley became statistician, economic studies, Comptroller's Department. He was in Administration C in 1948 until he returned to Comptroller's in 1950 as general statistician, economic and telephone studies. He has been chief statistician since February, 1958.

*Emerson Hunt*

EMERSON HUNT, general information manager of the New England Telephone and Telegraph Company, who reports in this issue on the reconstruction of Alexander Graham Bell's original workshop, has been engaged in public relations work for the New England Company since 1935. Before that he had been a newspaperman in Maine and in Boston. He came to the Bell System as editor for the New England Company's employee magazine, *Telephone Topics*, and in recent years he has been handling the Company's news and newspaper relations. From 1940 until 1945 he served with the United States Navy in Europe and in the Pacific and at present is a captain in the U. S. Naval Reserve.

ONE OF THE GREATEST authorities on poems relating to childhood and on the books in which they have appeared, JOHN M. SHAW now leaves Ma Bell to devote himself to his library of 5000 volumes and his scholarly pursuits in this chosen field. The first of his several contributions to the BELL TELEPHONE MAGAZINE appeared in the issue for April, 1933, not long after he

*(Continued on page 66)*

*A Historical Re-creation. Alexander Graham Bell's attic workshop at 109 Court Street, Boston, as it was in 1875, is now restored with the original timbers and contemporary equipment. It is in the lobby of the New England Telephone and Telegraph Company headquarters building in Boston.* *See page 33.*

*Some thoughts on how we have aided in the development of rocketry and how space vehicles may become of assistance to telephony in the years ahead*

# ROCKETS, THE BELL SYSTEM, AND THE FUTURE

WILLIAM D. BULLOCH

*Public Information Supervisor,* PUBLIC RELATIONS DEPARTMENT, A. T. & T. CO.

TEN YEARS AGO, a successful probe was launched toward outer space. A small rocket called a WAC *Corporal*, mounted in the nose of a captured German V-2, reached an altitude of 250 miles. Since that time, rockets have become an important part of our nation's arsenal, have placed artificial satellites into orbit around the earth, and have launched satellites that now revolve around the sun. This fantastic progress is typical of the rapid growth in technology that has characterized the period since World War II.

The Bell System has played a key part in this progress. During World War II, the military realized that a guided missile system would be needed to combat the improved bombing planes then being developed. To do this incredibly complicated job, they came to the Bell System, largely because of our experience in system, computer and radar design, as well as our excellent reputation with the various military services. In response to this request, the Bell System directed the effort that resulted in NIKE *Ajax*, this country's first operational guided missile system.

Since then, *Ajax* has been augmented by the improved NIKE *Hercules*, and now work is progressing on NIKE *Zeus*, our missile defense against enemy intercontinental ballistic missiles. In addition to the three NIKE missiles, the Bell System has supplied a variety of communication facilities, including the submarine cable at the Atlantic Missile Range, to aid in rocket testing and development.

The Marine Corps' TERRIER missile is also guided by equipment developed by the Bell System. Today, a guidance system for the first squadrons of America's TITAN intercontinental ballistic missile is being developed at Bell Laboratories, and work is being done to apply such a system to improve the accuracy of future space probes.

Since the work of the Bell System is closely associated with most advances in technology, we may expect that our part in rocketry and space exploration will increase in the coming years.

Rocket technology is advancing so fast that many of us have been left without the

background to evaluate intelligently the effects of this progress on ourselves and our business. These notes will briefly survey the field to try to supply some of this background.

Rocket propulsion was known and used by the Chinese at least as early as 1232 A.D. Its rapid development, however, stems from work done mostly during and after World War II.

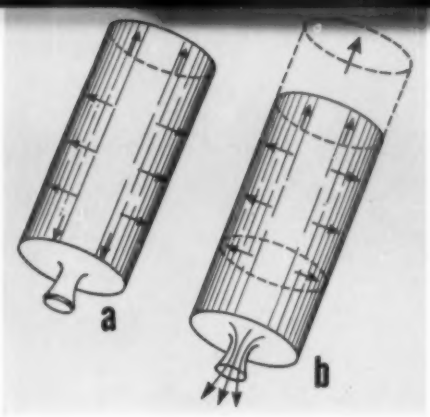



*Figure 1: Compressed gas exerts the same pressure on all inner surfaces of a sealed container. When the plug is removed, pressure at the bottom decreases and the temporarily higher pressure at the top causes the container to move in that direction.*

### *Rocket Propulsion*

ROCKET PROPULSION differs from that used for airplanes in a number of important ways. For example, rocket motors do not depend on air for their operation; they are not "air-breathing" power plants. In fact, they operate best in a vacuum.

For rocket propulsion, hot gases are formed in a combustion chamber and forced under pressure through a nozzle. The rocket is pushed ahead by reaction to the escape of the stream of gas. *This reaction takes place in the combustion chamber;* it does not depend on the exhaust gases pushing against anything outside the rocket. Hence, a rocket can operate in the near vacuum of space.

The "thought" experiment shown in Figure 1 illustrates this reaction principle. Imagine a cylindrical container filled with compressed gas, with a removable plug in the center of the bottom. The gas pressure inside this container is indicated in Figure 1a. As shown, the arrows representing

*An early rocket launcher mounted on a Sherman tank. This is one of several types of rocket launchers which used fire control equipment developed by Bell Telephone Laboratories for use in World War II.*

pressure on the sides of the container balance each other. Also, the pressure on the top is exactly offset by the pressure on the bottom.

Now let's pull out the plug. The gas immediately rushes out the hole and the pressure against the bottom drops to a much lower value. But the pressure against the top remains (temporarily) at approximately its original value, as shown in Figure 1b. The pressure against the top pushes the cylinder ahead. Technically speaking, this is an example of Newton's third law of motion—to every action there is an equal reaction in the opposite direction. In this case, the escaping gas is the action. The movement of the cylinder, caused by the unequal pressures, is the reaction.

If there were some way in which the gas pressure within the cylinder could be maintained, the pressure difference between the top and bottom would also be maintained and we might expect to get useful motion. This is how a rocket works.

The cylindrical container becomes a combustion chamber and the hole in the bottom becomes an exhaust nozzle. Gases under high pressure are provided by burning some sort of fuel.

### *The Speed of Rockets*

IT IS CONVENIENT to describe the requirements for a particular flight in terms of the rocket speed necessary to complete that flight.

Some mathematics, which need not concern us here, indicates that the speed a rocket can attain depends on the product of two quantities. One is the velocity of the exhaust gases and the other is related to a quantity known as the mass ratio. This latter is the mass of the rocket at take-off, divided by the mass at the instant the motor ceases to operate (called burn-out or brennschluss).

*The* TERRIER *(above) is a supersonic surface-to-air missile for use aboard ship or from a Marine Corps mobile launching vehicle. It is a 2-stage solid fuel missile with a speed of about 1700 mph. Ground guidance equipment (below) detects and tracks the enemy, then guides missile to target.*

The speed, and hence the range, of a rocket can be increased if we increase the exhaust velocity or the mass ratio, or both.

Exhaust velocity depends on a number of conditions, including the temperature at which the fuels burn, the pressure of the gases in the combustion chamber, and the

molecular weight of the exhaust gases. These factors depend mainly on the choice of fuels and the way in which they are mixed. With chemical fuels, exhaust velocities of more than 10,000 miles per hour may be possible.

Since the mass ratio is the weight of the rocket plus its fuel divided by the weight of the rocket without fuel, it can be increased by decreasing the over-all weight of the rocket structure. The mass ratio of a modern rocket may be more than six.

The motion of a rocket (at least those available today) depends on the combustion of a fuel. We know, however, that a rocket operates best in empty space, and that chemical combustion requires oxygen. Since there is no oxygen in space, a rocket must carry its own supply. Therefore, when we speak of propellants, we mean the fuel and a source of oxygen called an oxidizer.

Chemical propellants are divided into two general classes—liquid and solid. Typical liquid fuels include kerosene, alcohol, hydrazine, and liquid hydrogen. Typical oxidizers are nitric acid, nitrogen tetroxide, liquid fluorine, and liquid oxygen, called lox.

In high performance liquid fuel rockets, the propellants must be injected into the combustion chamber at the rate of hundreds of gallons per second. This means that either they must be forced from the rocket tanks by compressed gas (often air or helium) or a system of pumps must be provided in the fuel lines between the tanks and the combustion chamber. Either system adds dead weight to the rocket.

One way to escape the problem of the added weight of either pressure or pump feed systems is to use solid fuel rockets. Many of the rockets now being developed are of this type. In these rockets, fuel and oxidizer are intimately mixed and cast into a solid called the grain.

A severe problem with solid fuel rockets is that of casting, transporting, and loading the grain without cracking it. Ignition may occur even in hair-line cracks and often results in an explosion.

Although all the rockets available today are based on chemical combustion of fuels, this is by no means the only possible propulsion system. Others include nuclear power, solar power, and electrical systems.

### *Rockets in Flight*

SOME PROVISION must be included in any rocket vehicle for controlling the attitude and direction of flight. Within the atmosphere, controls of the sort used on airplanes are sufficient. For flight outside the atmosphere, however, they are useless. There, control is obtained by deflecting the stream of exhaust gases itself. This can be done by including controllable vanes in the exhaust nozzle or by mounting the entire motor in such a way that it can direct the exhaust stream at an angle to the rocket.

For our purposes, we can divide rocket flight into three general classes: Flight from one point to another on or near the surface of the earth; from the surface of the earth to a satellite orbit; from the earth to some other body in the solar system.

For long-range flights of the first type, the rocket is usually accelerated rapidly straight up or nearly straight up, to keep from wasting fuel in overcoming air resistance in the denser portions of the atmosphere. When the desired altitude has been reached, the rocket is turned towards the target and accelerated to the required velocity. At this point, the motors stop and the rocket becomes a ballistic missile. That is, it follows a path, or trajectory, controlled by natural forces. This is the same path that an artillery shell would take if it were fired from the same point in the same direction with the same velocity.

The second of our classes of flight, satellite orbits, has the same general requirements as the first except that a higher initial altitude must be reached and higher velocities parallel to the earth are needed.

This brings up the familiar question—"What keeps a satellite up?" The classic answer is that at a given altitude there is a particular speed at which the centrifugal force, tending to make the rocket fly away from the earth, is exactly balanced by the force of gravity, tending to pull the rocket back to earth. The result of this balance is an orbit around the earth.

But perhaps we can get a clearer idea of this process by performing another thought experiment. Imagine we could build a tower high enough so that the top would extend well above the atmosphere. If we climb to the top of the tower and throw a baseball, it will travel a certain distance before it strikes the earth, depending on the speed with which we throw it. Gravity begins to act on the ball as soon as it leaves our hand. As a result, the ball will follow a path like that indicated in Figure 2a. If we repeat the experiment but this time throw the ball harder so that it has a higher initial speed, it will travel farther before gravity pulls it to the surface of the earth, as shown in Figure 2b. If we repeat this process, each time throwing the ball a little harder, we can imagine the situation, illustrated in Figure 2c, in which the ball returns to the starting point. It started to "fall" as soon as it was released, but, because of its curvature, the earth "fell away" from the ball at the same rate.

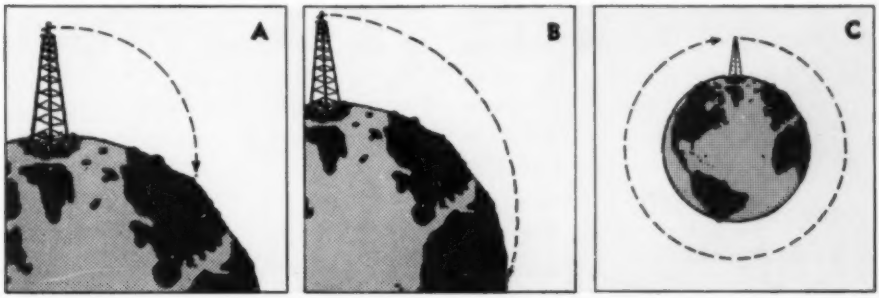
Since we specified that the tower extended above the atmosphere, there has been nothing to slow the ball down in its traverse around the earth. Therefore, it will start another traverse with the same initial conditions—the ball is in orbit. If a rocket launches a satellite in the proper direction with the proper speed it will follow a similar path. Actual satellite orbits are usually not circular, but rather elliptical. The low point on such an orbit is called the perigee, and the high point is called the apogee.

The velocity required for a satellite to go into orbit at an altitude of several hundred miles is about 17,000 miles per hour. The required orbital velocity decreases as the altitude of the orbit increases.

### *Satellites at Work*

THE POTENTIAL USES of artificial satellites fall into two overlapping categories—military and civilian. Those uses that are pri-

*Figure 2: A baseball thrown from a tower begins to fall as soon as it is released (A). If the ball is thrown harder, it travels farther before striking the ground (B). If the initial speed is high enough, the ball will encircle the earth and return to the starting point (C).*



marily military include reconnaissance, terrain mapping, international inspection, early warning of missile firings, monitoring shipping, and earth bombing.

Primarily civilian uses include astronomical and earth photography, cloud observation and weather prediction, hurricane and typhoon warning, iceberg patrol, and navigational aids.

Two other uses which have both military and civilian applications are as communications relays, and for basic research on the upper atmosphere and outer space. Communications relays might be of special interest to the Bell System. Such a relay might be either passive or active. A passive relay would consist of a large surface from which signals could be reflected to reach a distant point. An active relay would contain the circuits necessary to receive signals, amplify them, and rebroadcast them to distant points.

A special satellite orbit, called a 24-hour orbit, would be particularly useful for a communications relay. If a satellite could be launched eastward from near the equator to an altitude of about 22,000 miles and given an orbital velocity of about 6,800 miles per hour, it would complete one revolution in one day. The satellite would remain fixed over one point on the surface of the earth. Such a satellite would have nearly half the earth in sight. Three such satellites could cover the entire earth.

Many of the satellites launched to date have had exploration of the upper atmosphere and outer space as a primary purpose. Among the measurements taken by these satellites are temperature, meteor bombardment, and radiation intensity. The measurement instruments are such that their outputs consist of electrical signals. These signals are radioed back to earth directly or recorded on tiny tape recorders. In the latter case, information from the tapes is radioed back to earth when the transmitter is triggered by a pulse from a monitoring station on earth.

Temperature measurements are often taken through the use of a thermistor. This device, invented at Bell Laboratories, changes its resistance and hence the value of an electric current flowing through it with changes in temperature. These changes in current are recorded on the tape.

Meteor measurements are made in several ways. For micro-meteorites (tiny particles) a strip of current-carrying metal is mounted outside the satellite. Constant bombardment by micro-meteorites gradually wears the metal away and increases its electrical resistance. This changes the value of the current flowing through the strip and gives a measure of the density of these particles. Another system is the use of a sensitive microphone which records the "ping" of a small particle as it strikes the satellite.

A larger particle would penetrate the thin walls of the satellite and allow gas kept inside to escape. The resulting change in pressure is also recorded for transmittal back to earth.

Cosmic radiation is often measured by miniature Geiger counters which generate a recordable voltage each time a particle passes through them.

The recorded information is broadcast, often as a modulation of the tracking signal, by transistorized radios (the transistors were also invented at Bell Laboratories). In VANGUARD I, the tracking radio is powered by Bell Solar Batteries.

In recent tests, the instruments and tape recorder have been encased in a plastic capsule which is designed to be ejected from the satellite upon command. Efforts are made to recover the capsule either while it is floating to earth by parachute

or after it has landed (preferably in the sea). To aid in this recovery, the capsule contains a SOFAR bomb, a special radio transmitter, and a packet of shark-repellent dye. When the capsule strikes the water, the bomb drops free and explodes deep beneath the surface. The underwater sound is picked up by listening posts and used to guide search parties to the general area of impact. Contact with salt water also triggers the radio transmitter, which helps guide search parties in the area. The dye provides the final clue to the location of the capsule.

The third general class of rocket flight—trips to other bodies in the solar system—is an extension of the second. The most efficient path is generally a portion of an ellipse around the sun. Biggest payload can be carried if the voyage is so arranged that the start and end lie on a line directly across the sun from each other.

### *Guiding the Missile*

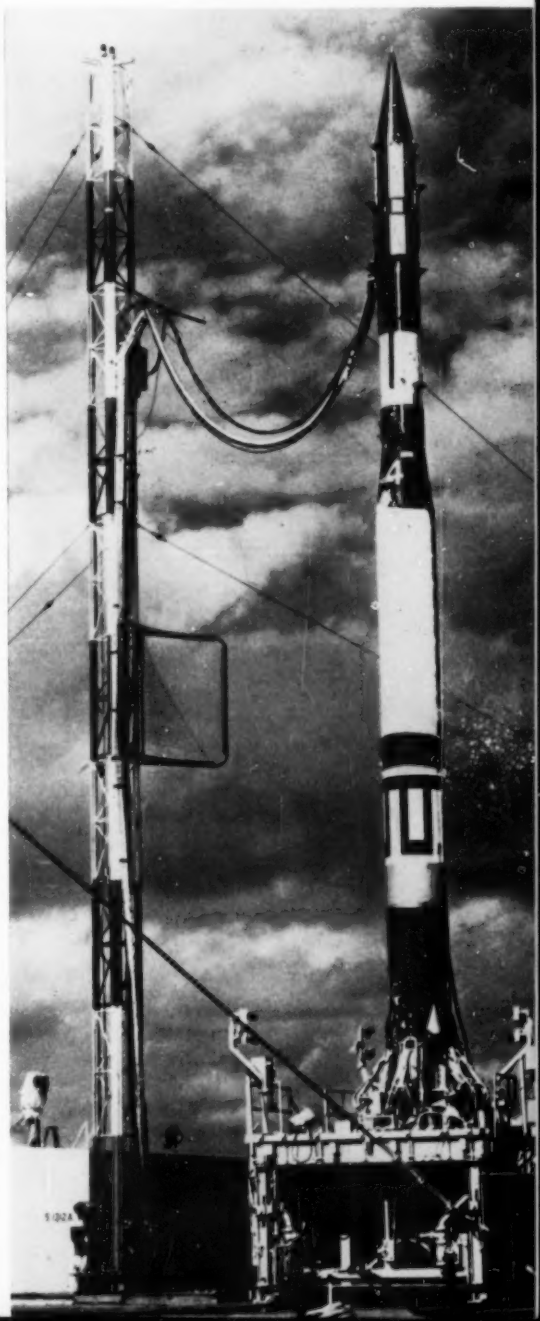
ALL THE FLIGHTS discussed require that there be some means of guiding the rocket. The Bell System has played an important part in this phase of rocketry.

Important guidance systems are: Command and all-inertial.

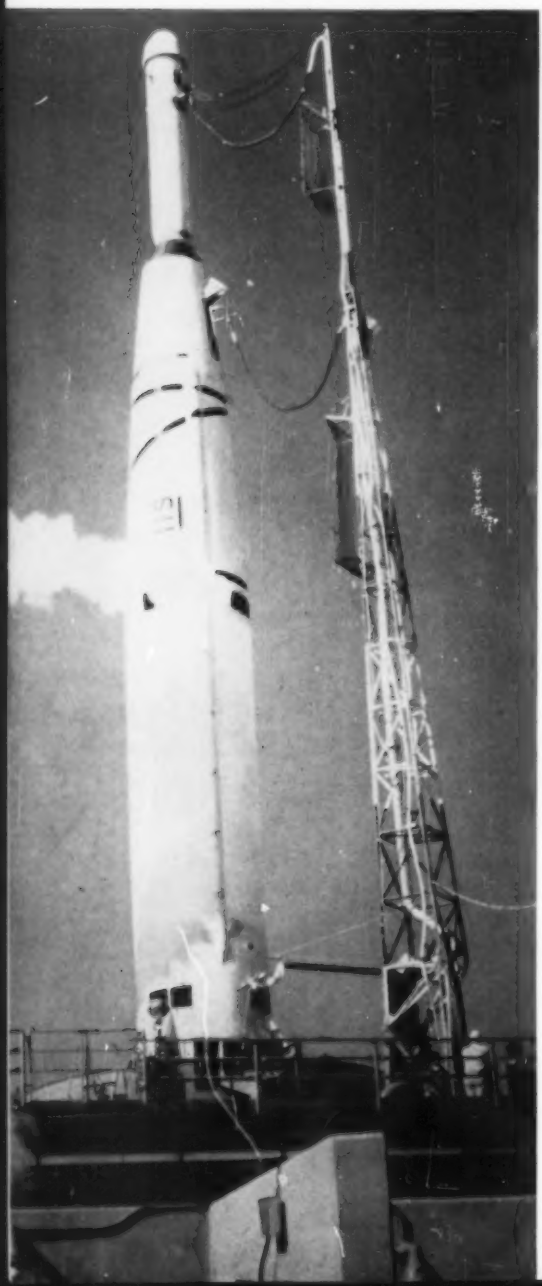
A command system is characterized by the fact that the missile is guided throughout its flight from a command post on the ground. The NIKE missile is an excellent example of this system.

A target is selected from a display presented by the acquisition radar and followed by the target tracking radar. After the missile is launched, it is directed in flight by the missile tracking radar. Directions for flight originate from a computer which processes data supplied by the target and missile tracking radars. An order to change the flight path is transmitted to the rocket by the missile tracking radar.

VANGUARD, *designed as a satellite launcher: First stage, pump-fed liquid fuel; second stage, pressure-fed liquid fuel; third stage, solid fuel. It launched* VANGUARD I *satellite, carrying Bell Solar Batteries, and* VANGUARD II *weather satellite.*



THOR-ABLE *is a* THOR *booster with an added second stage, used to test the Bell Laboratories' guidance system aiding recovery of the nose cone after its re-entry into the earth's atmosphere. It operates on liquid fuel and has a speed of 10,000 mph.*



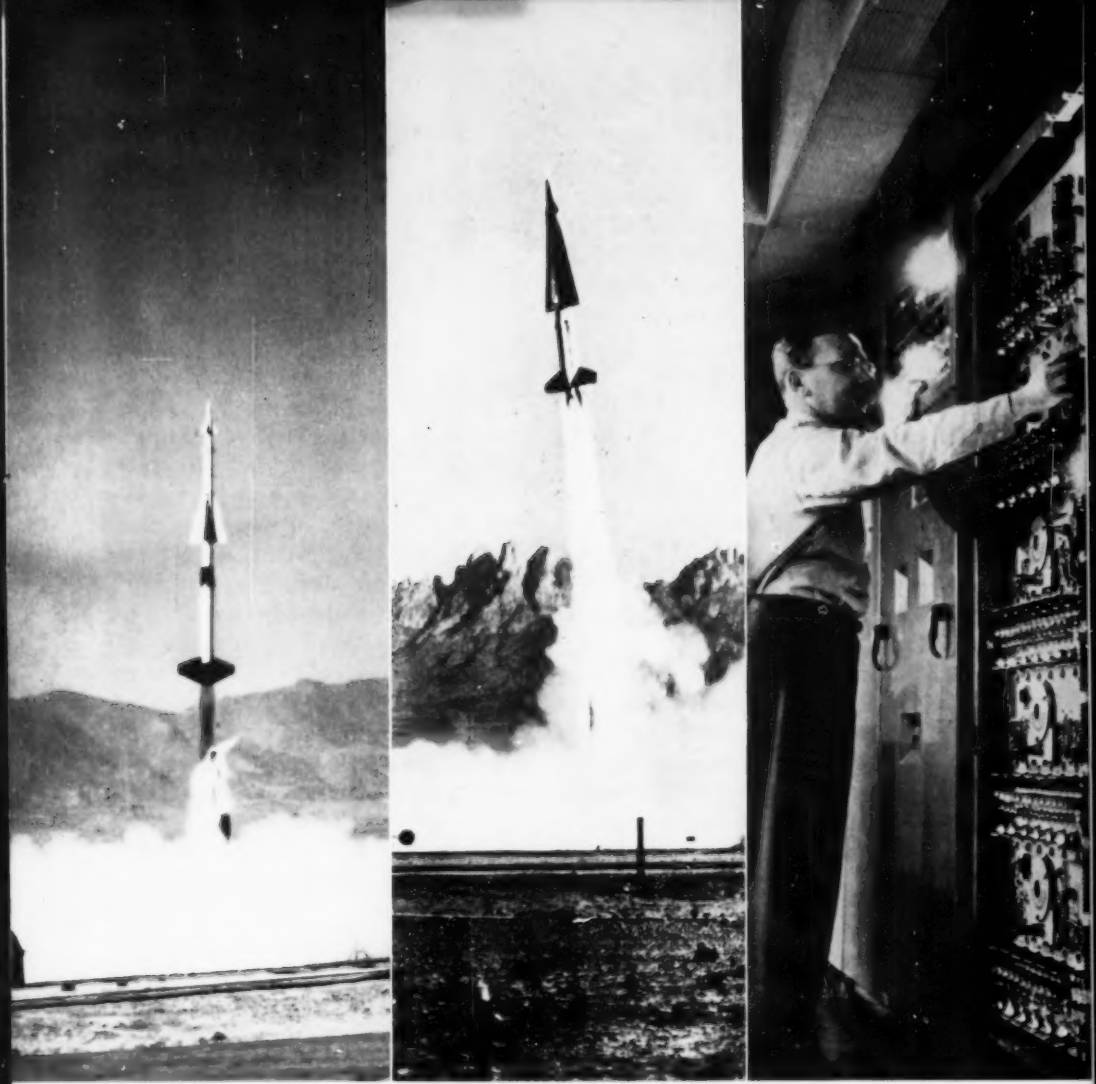
When the signal is received, it is converted to a voltage which operates the steering surfaces.

The guidance system for ballistic missiles operates only during the relatively brief powered portion of the flight. To insure that the missile will travel over a predetermined flight path (to reach a target or a satellite orbit), the guidance system must perform two critical jobs. First, it must guide the missile to a predetermined point where the motors are to be stopped. From there, the missile takes up a ballistic trajectory, or so-called free flight. It must also insure that the missile reaches this point with just the right velocity. The second job is to see that the propulsion system cuts off at just the right instant. Small errors in the speed of the rocket will result in relatively large errors in the flight path.

In many systems, the proposed flight path for a rocket journey is described mathematically and stored in the memory unit of a computer. Then, during powered flight, some mechanism is used to determine the rocket's actual position and speed from moment to moment. These measurements are compared with the information stored in the computer and any differences are used to direct the vehicle back as nearly as possible to the ideal path.

In an all-inertial system, the machinery needed for the guidance job will be included within the rocket itself. After it is launched, there will be no contact between the rocket and the outside world.

An inertial guidance system includes a set of gyroscopes which stabilize a platform within the rocket. Mounted on this platform are three instruments called accelerometers. These accelerometers are so arranged that they produce outputs which correspond to any changes in the motion of the rocket. The outputs give a complete picture of the vehicle's motions.



*The* NIKE *Series. More than 10,000* NIKE Ajax *missiles (left) have been manufactured and delivered. It is a surface-to-air missile with a first-stage propellent of solid fuel and second-stage liquid fuel, 35-mile range and speed of 1500 mph.* NIKE Hercules *(center), an improved surface-to-air missile, can carry a nuclear war head. It uses solid fuel in both stages and has a speed of 2200 mph.* NIKE Zeus *development is proceeding (right) with Western Electric as prime contractor. It is the nation's first anti-missile missile.*

Outputs generated by the accelerometers are fed into a computer carried in the rocket and compared with the values for that instant programmed in the computer in advance. Any differences that are detected appear as signals which are used as commands to the vehicle's control system. The control system then takes the necessary action to return the vehicle to the predetermined path.

When the proper position, orientation, and speed have been reached, the rocket motors are turned off by signal voltages from the computer. With liquid fuel motors, this can be done by cutting off the supply of either fuel or oxidizer or both. In solid fuel rockets, small charges are ignited to either blow off the rocket nozzle or open vents in the combustion chamber.

A guidance system for ballistic missiles is being developed by Bell Laboratories for use in guiding the first squadrons of TITAN ICBM's. It is an outgrowth of the command system used with NIKE.

In this system, the position of the vehicle during powered flight is constantly determined by a special highly accurate ground-based radar.

These radar measurements and information obtained from the inertial characteristics of the missile are combined in a ground-based computer in a way that has been mathematically determined to give the best over-all results. Once again these data are compared with previously stored trajectory information. The computer initiates any required corrective orders which are transmitted over the radar beam to the control system in the rocket. This system is often called "radio inertial" because a combination of radio and inertial information is used in deriving guidance commands.

AS WE HAVE SEEN, the Bell System is active in developing guidance systems for rocket flight, and in providing basic inventions—including transistors, thermistors, and solar batteries that help make guided rocket flight possible and satellite flights useful.

Tomorrow, who knows what advances Bell System research and engineering will contribute to rocket and satellite flight, and what the Bell System will gain from rockets and satellites in helping to provide the best possible communications service at the lowest possible cost.

*The Bell System is participating in the development of ETV, which promises opportunities for growth in this new phase of communications*

# EDUCATIONAL TELEVISION—A NEW FIELD OF SERVICE

CALDWELL BUCK

*Staff Engineer,* BUSINESS RELATIONS DEPARTMENT, A. T. & T. CO.

THE BELL SYSTEM COMPANIES had a key role in the growth of commercial television. They furnished the local channels to connect TV studios with broadcast transmitters and built the nationwide network which carries TV programs from coast to coast. If *educational* television fulfills its present promise, the telephone companies may be called on to play a somewhat similar role again.

This potential opportunity to furnish what could become an essential new public service stems from the tidal wave of new pupils entering our schools and colleges. Two million more are added each year, and each generation of pupils seeks more years of education. By the end of 1960, elementary school enrollments will be an estimated one-third higher than in 1955, high school enrollments will be up a fourth, while college enrollments may double by 1965.

But new pupils require added teachers, more classrooms—and teachers and classrooms are not keeping pace. Experts estimate that the country is short 135,000 teachers right now and that the number of teachers would have to expand more in the ten-year period 1955-65 than in all the previous thirty-five years. One half of all college graduates would have to enter school teaching during these ten years to fill the need. Colleges and universities will need to add more teachers in this same period than in all their previous history. As for classrooms—assuming present normal-sized classes, we would have to be building several hundred new ones each day to catch up with needs by 1965.

There, briefly, is the nub of the problem: the "crisis in education" we hear more and more about these days. Coming on for years, its ominous implications have become plain to all in this post-Sputnik era.

During these same years, television was demonstrating its almost uncanny ability to hold the attention of young and old alike, plus a flexibility and ease of use which film alone had not offered. Thoughtful educators began early to experiment. Results encouraged more trials. And thus

*Teacher at Hagerstown, Md., presents a television lesson in the central ETV studio of the Washington County Board of Education. The television cameras, and TV monitors in foreground, are operated by students.*

today there is a promising newcomer: educational television—ETV.

What Is ETV? What does it promise? Three years ago, when we at A. T. & T. first set out to learn what education was doing with television, contact with national organizations active in the field gave us a real eye-opener.

We had known that in 1952 the Federal Communications Commission had set aside 242 television channels for educational purposes (since upped to 257), the majority in the little-used UHF bands, and that a few isolated ETV broadcasting stations had started up. But there was nationwide activity, a literal ferment in education going on. Educators were seeking help in using this new tool—technical as much as financial help. It seemed a "natural," then, for telephone companies participation, with our TV transmission know-how and facilities. It seems even more so today.

In the meantime, ETV activity has speeded up. During this past school year, several hundred thousand students received at least a part of their formal instruction via the television screen. Twelve more ETV broadcasting stations came on the air, making a total of forty-three—with seven more under construction. One hundred and thirty-odd closed-circuit TV systems were in use for classroom instruction in schools, colleges, and universities. Perhaps two hundred or more commercial broadcasting stations were regularly cooperating with schools and colleges in transmitting instructional programs for either in-school or home students. In addition to formal instruction by television—ITV, as some now refer to it—both educational and commercial TV stations broadcast many worth-while programs of a general educational or cultural nature.

The oldest of the ETV broadcasting stations—KUHT, sponsored by the University of Houston, Texas—just had its sixth birthday last May 25th, which makes one re-

alize what a lusty newcomer ETV is. By contrast, the idea of broadcasting instructional material for classroom use is an old one, going back to radio pioneering at the University of Wisconsin in 1921. Currently some 160 educational radio stations are on the air.

Already, in some of the ETV trials under way, telephone company people have shown they can deliver what the ETV educator wants, when he wants it. A case in point is Hagerstown, Maryland—the most extensive current experiment with closed-circuit television for in-school instruction. In late Spring 1956, Hagerstown was selected by a sponsoring group as offering the most favorable available setting in which to conduct a thorough trial of television for elementary and secondary school teaching. The Fund for the Advancement of Education—an arm of the Ford Foundation which has been particularly active in sponsoring ETV projects—would conduct a training course for Hagerstown teachers. The Radio-Electronic-Television Manufacturers Association (since become Electronic Industries Association, or E.I.A.) would see that cameras, monitoring equipment, receivers, and other equipment, were provided. The technical staff of the Washington County Board of Education would do the in-school wiring. And The Chesapeake and Potomac Telephone Company of Maryland was asked to provide the TV channels between schools—enough so that up to six programs could be sent simultaneously and designed so that programs could originate at certain selected points on the network and be sent to all schools. Eventually they would cover maximum hauls of up to thirty miles.

A tall order. Nothing like it was on our shelves. But that summer the C. & P. of Maryland people, assisted by A. T. & T.'s Operation and Engineering Department, the Bell Telephone Laboratories, and Western Electric, designed, developed, and rushed into being a coaxial cable net-

*Elementary school pupils in Hagerstown, Md., pay rapt attention to their TV teacher. Indications are that television helps minimize classroom disciplinary problems.*

*Hagerstown, Md.: The lower of these two cables (with an amplifier box) is part of the 78 miles of Telephone Company coaxial cable which carries up to six ETV programs simultaneously.*

*Below: The transmitting room in the Hagerstown central ETV studio has 15 bays of supporting equipment for the television studios (on the left). At right are the Telephone Company's transmitting terminals for 6 TV channels.*

work connecting eight of the Hagerstown schools with each other and with a central studio. The system was ready for the opening of school in September 1956. It was extended during the Summer of 1957 to two junior high schools, eleven elementary schools, and a special education center—totaling thirty-three miles of cable. In September 1958, thanks to more fast work on C. & P.'s part, seventy-eight miles of improved-type coaxial cable reached 16,500 out of the 18,000 pupils enrolled in Washington County: all except twelve small elementary schools. And it works fine.

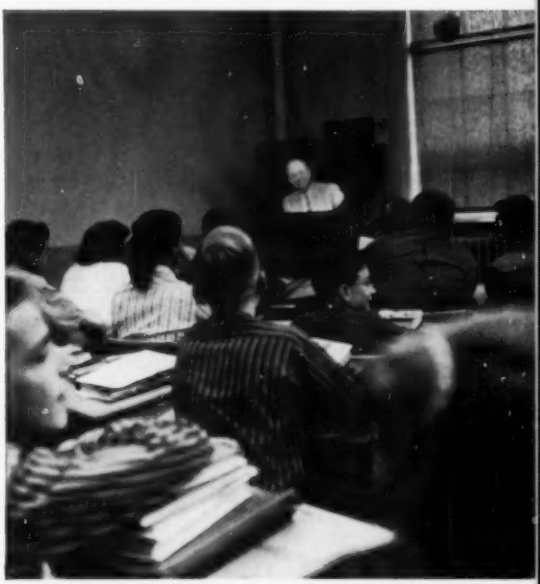
HAGERSTOWN WAS THE FIRST to show that the telephone company can provide the channels for ETV, and to demonstrate the value of our teamwork in meeting education's communication needs. Several closed-circuit ETV projects followed soon after. One of these is Cortland, New York, where the New York Telephone Company is providing a closed-circuit TV cable system connecting eight public schools in the Cortland area. This project is unique in that the New York State Department of

*A class in a San Jose, Calif., elementary school is televised for viewing by teachers in training at the San Jose State College. Camera is to left, above teacher.*

Education, which sponsors it, also asked for a loudspeaker-microphone arrangement so that students in each of thirty-two classrooms could ask questions of the TV teacher and get their answers on the spot. The New York Company "delivered," thanks to their own ingenuity plus more teamwork. So now educators will have more data to throw light on one of ETV's numerous questions: just how desirable is some means for letting the TV student ask questions while class is going on?

Another example is San Jose State College in California, where the Pacific Telephone and Telegraph Company is furnishing a coaxial cable system between the college campus and four public schools in San Jose. Through use of a mobile studio, classroom teaching in the schools can be observed by students of education during their classes at the college. A regular studio on campus permits televising live programs there.

Still another is Jefferson County, Kentucky, in which Louisville is located. There



*TV class in a public school at Cortland, N. Y. Microphone to right above TV receiving set is part of a loudspeaker-microphone arrangement whereby students can ask questions of the TV teacher and be answered during class.*

the Southern Bell Telephone and Telegraph Company is providing a microwave radio link plus coaxial cable links for a closed-circuit system which interconnects several elementary schools of the County, primarily for experiment in teacher training.

Note that the above cases involve multichannel *closed-circuit* TV, the televised material being transmitted from the originating point to receiving sets in the same or different buildings over coaxial cable or beamed radio. Only TV sets hooked up to the circuit are able to receive the programs. Transmission may be on a one-way only basis, as in Jefferson County, or "round robin," as in Hagerstown.

In *broadcast*, or "open circuit," TV, the televised material is transmitted via a central broadcasting station, and is receivable on any appropriate TV set within range. A single station can send out but one program at one time. Networks of such ETV broadcasting stations are being planned, though thus far the only one actively working is in Alabama, where the State Educational TV Commission has three ETV stations by microwave radio. Some educators predict regional or even nationwide ETV networks within the next five to ten years. Others feel that video tape developments, plus use of film and kinescope, may make longer haul ETV transmission channels unnecessary.

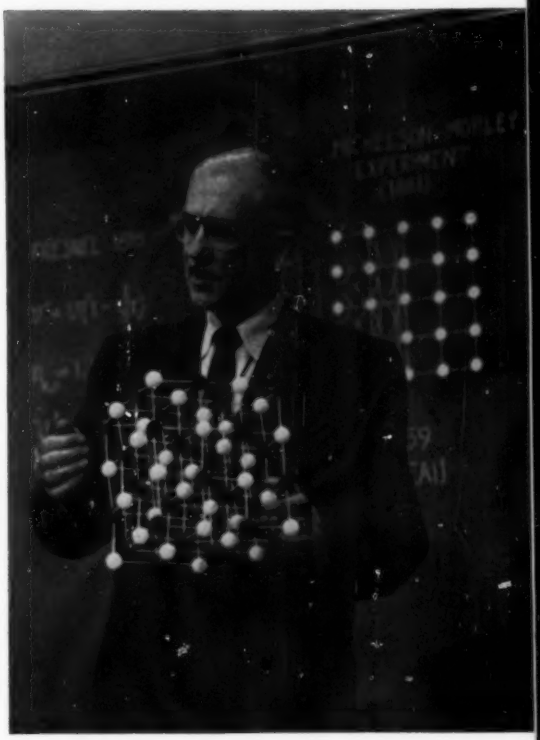
THE POSSIBILITY of nationwide network ETV was demonstrated this past school year by "Continental Classroom"—a TV college course in Atomic Age Physics, which the Bell Telephone System helped to support. Conducted by Dr. Harvey E. White, it was broadcast from 6:30 to 7 A.M., Monday through Friday, for thirty-two weeks over 149 broadcasting stations connected to the NBC network via telephone company TV channels. Some 250

*Science lecture via television in this Milwaukee high school is part of a nationwide experiment in conducting large classes by TV. Eight receiving sets are used in this classroom.*

colleges and universities offered academic credit to students who enrolled for this course, and over five thousand did so, in most cases paying their particular college's regular extension course fees. Twenty-seven thousand students sent in 50c each for the course outline—astonishing evidence of ETV's impact. Even more astonishing, an estimated quarter of a million other people, of all ages and occupations, started getting up early to view the course.

During the 1959-60 school year, Continental Classroom will present a new course, Modern Chemistry, starting September 28. Also, the physics course will be repeated during the preceding half-hour, 6 to 6:30 A.M. local time.

The above-mentioned cases in which we have taken part are but a few drops in a big ETV bucket. But they do show the telephone companies' ability to provide any type of TV transmission facilities, whether between schools, between cities, or across the country, that educators may need if television proves the answer to education's problem.



*Dr. Harvey E. White, teacher of the coast-to-coast "Continental Classroom," holds a model of a sodium chloride crystal. This college course in Atomic Age Physics was given last school year over the NBC network; it will be repeated this year.*

Will ETV be the solution? Well, the answer to that one isn't known yet. But evidence is accumulating rapidly that while television may not offer the whole answer, it can furnish an important part. Each of today's educational television projects is aimed at one or more of the many questions which need answering in order to evaluate ETV for the long pull. To mention a few examples—

Does the learning of students increase in courses especially adapted for ETV as compared with conventional methods? Extensive programs at Pennsylvania State University and New York University, among others, have shown that the answer can be yes—other things, such as caliber of the teaching, being equal.

What changes are needed in the teacher's procedures to make them most effective on TV? Hagerstown has already demonstrated, for example, the effectiveness of the "team play" approach to TV teaching, with the classroom teacher an equally important member of the team along with the TV teacher.

Can TV teaching be successfully carried to the home? San Francisco State College has been teaching students at home via programs broadcast from ETV station

*A group of Hagerstown, Md., teachers planning forthcoming television lessons for a high school English course. The team technique has proven effective—each classroom teacher is as important a member as the TV teacher.*

KQED. Chicago City Junior College has been offering a full junior college program over ETV station WTTW. Possibilities being tried elsewhere include teaching of bed-ridden students, adult education, and college extension courses.

Will the use of television permit larger classes in the public schools without lowering the quality of instruction? To help find out, the Fund for the Advancement of Education has a three-year ETV experiment under way: the "National Program In The Use Of Television In The Public Schools." A dozen large city school systems are taking part*, as well as smaller city and rural school systems in three states: Oklahoma, Nebraska, and North Carolina. This past school year saw ninety thousand students included, in classes numbering from ninety to over five hundred. First year results are already casting doubt on the long-held educational theory that the smaller the class, the more effective is the teaching. A higher level of achievement is seen in the large groups instructed by TV as compared with control groups using traditional methods. Interesting too is indication of possible economic benefits, such as substantial savings in school construction costs arising from ability to use larger classrooms.

Other ETV projects have unusual or significant angles, such as

—The Chelsea experiment in New York City, where apartments in a huge low-cost housing development are connected by closed-circuit TV with a nearby public school for adult education, primarily

*Atlanta; Cincinnati; Miami and Dade County, Florida; Detroit; Evansville; Louisville and Jefferson County, Kentucky; Kansas City; Milwaukee; Norfolk; Oklahoma City; Philadelphia and Wichita.

in English, and to help co-ordinate home and school activities.

—Evansville, Indiana, where a group of school districts is co-operatively using common ETV facilities and programs, a type of planning which will be needed for most economical use of ETV.

—New York State Education Department's lease of commercial station WPIX for broadcasting daily lessons by expert teachers in a dozen subjects for classroom use throughout the metropolitan area. Michigan State University recently announced another sort of commercial-educational arrangement whereby the University station WMSB will share Channel 10 with station WILX and broadcast 38½ hours of university-produced educational programs each week.

Just mentioning these few of the many ETV projects across the country gives more than a hint that educational television is becoming a way of educational life. Published analyses and evaluations of results thus far seem to indicate pretty clearly that students at all levels, and in most subjects, can learn as well by televised as by direct instruction. They indicate also that through the use of television the scope of able teachers can be extended; the educational program can be widened and enriched; many teaching practices can be improved; and the over-all quality of instruction bettered. Apparently both students and teachers readily learn to accept, and adapt to, the use of television. These are typical of the findings experts in the field say they are gleaning from this experimental era in ETV's development.

WHEN WILL EDUCATIONAL TV grow out of this experimental period and become an accepted medium? Again, it's too early to say. A big "if" here is money, which thus far has come from a variety of sources. Much of it has come from colleges and universities, and grants from some fifty foundations. The Ford Foundation alone has contributed close to $30 million to ETV projects. A number of ETV stations are supported by community ETV Associations, backed by various local organizations, school bodies, and individuals. Industry—i.e., the TV equipment manufac-

*Introducing one of a series of telephone company programs on the Alabama State ETV network. Theme of the series was "Communications: From Caveman to Cosmos." This particular program was on instruments and techniques of telephony.*

turers, the TV broadcasters, the telephone companies, and others—has made substantial contributions.

You and I are an important source of ETV financial support: we the taxpayers—local, state, and Federal. State legislatures have allocated funds for ETV—as in Alabama, Florida, Oklahoma, New York and others. The National Defense Education Act of 1958 provides for grants up to a total of $18,000,000 over four years for research into more effective use of newer educational media such as television.

The present Congress has had before it a number of bills to make Federal funds available for ETV. One passed by the Senate would make available $1,000,000 in each state for acquisition of educational TV facilities. Action on similar measures in the House of Representatives has been deferred pending committee studies to be made this fall. So long as "acquisition" is understood to include by lease as well as by purchase, the telephone companies' only immediate concern with such ETV legislation is probably that of any other taxpayer.

However, if ETV does help solve the educational problem—if it enables the available teachers to give higher quality instruction to more students—then ETV should prove itself in and be able largely to pay its own way.

Suppose ETV does prove in—the money found. Will educators look to the telephone companies for the needed TV channel facilities? The answer can be yes, if we use today's opportunities in ETV as a stepping stone to tomorrow's potential. Aside from the provision of channel facilities, ETV offers other ways in which telephone company people can assist the educator. For one, "resource" material is needed for classroom instruction, whether presented via the TV screen or direct; by films, demonstrations, or exhibits. As has already occurred to many, the telephone industry has a wealth of such material suitable for ETV use, much of it particularly pertinent in the light of today's emphasis on more and improved engineering and science training. In numerous instances—as in Alabama this Spring, Milwaukee and Louisville last year—Bell Company people have made valued contributions to ETV programming.

Again, by taking part in the community associations which support ETV broadcasting stations, telephone people are helping to focus Company know-how on local ETV problems, where it can often do the most immediate good.

OUR BRIEF REVIEW OF ETV has given at best but a sketchy picture of this new approach to our educational problems, into which so many dedicated educators and administrators are putting time, thought, and energy. Their efforts are of fundamental interest to all of us as parents, as citizens, as telephone company employees. In yet another sense, the telephone industry has an important stake in the outcome of these efforts and the potential opportunity for public service they present, for on that outcome may depend our ability to obtain the trained man-power and woman-power, the engineers and scientists, needed to carry on the business in the years to come.

*System employees as good citizens should be concerned with their governments' fiscal policies and make their feelings known to appropriate authorities*

# GOVERNMENT FINANCES IN ECONOMIC PERSPECTIVE

JOHN C. SWARTLEY

*Chief Statistician,* COMPTROLLER'S DEPARTMENT, A. T. & T. CO.

GOVERNMENT FINANCES are of great concern to all of us, since they inevitably have to be supported by the earnings of individuals and corporations. In the preceding issue of this MAGAZINE, Alexander L. Stott, A. T. & T. Comptroller, discussed the burden of taxes on the Bell System. In the following pages, the topic of government fiscal policies is treated within the framework of the whole economy.

In the last three decades, government finances have played an increasingly important role in the Nation's economy. Beyond their sheer magnitude, the sums passing through government hands have attained prominence because of their rapid rate of growth and their tendency to influence directly more and more segments of the free enterprise system. Recent developments particularly have focused public attention on the spending and taxing record of governments. For the fiscal year ending in mid-1959, the outlook is for a Federal budget deficit of nearly $13 billion, by far the biggest in peace-time. For fiscal 1960, two states and a city—New York, California, and New York City—have proposed record budgets, each exceeding $2 billion for the first time. Total gross taxes of all levels of government are rapidly approaching the annual rate of $700 per capita.

Of the various major factors in the economy, government finances were characterized by the fastest rate of growth in the past half century. During that period, the population nearly doubled; the physical volume of the Nation's output (Gross National Product or GNP) increased four times, the current value of GNP over twelve times. Within the same 50 years, state and local government budgets grew 20 fold, the Federal budget over 130 fold. As a result, government finances have exerted an increasing influence on many aspects of the economy, including consumption, production, employment, and finance.

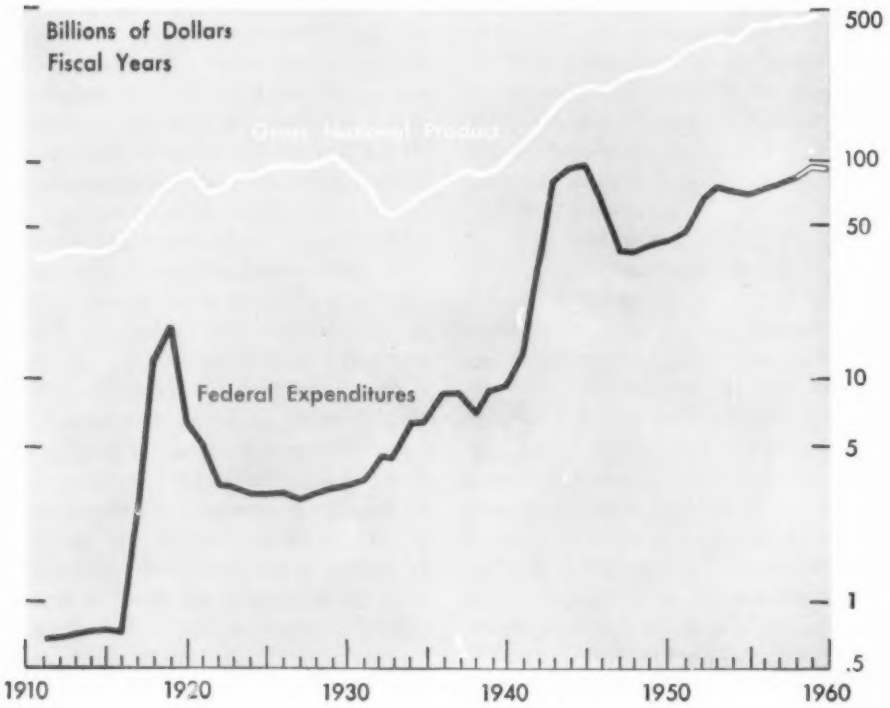
### *Government Expenditures*

THE SIMPLEST WAY to measure the growth of government finances is to review total expenditures over the years. However, direct comparisons of published figures do not always tell the whole story. In the Federal budget, as the term is commonly used, certain types of spending are not reflected because they are charged to specially identified trust funds (old age, civil service pensions, highways, etc.). In contrast to this restrictive concept of an "administrative" budget, the "cash" budget encompasses all expenditures to the public regardless of purpose or accounting procedure. State and local budgets also have these two bases of reporting. Chart 1 shows, along with GNP, the "cash" expenditures of the Federal Government in the last 50 years.

The impact of the two World Wars on Federal spending stands out clearly. The contrast between the two post-war periods is also noteworthy. After World War I, there was a sharp cutback in expenditures and within three years over 80% of the war-time increase had been canceled. Subsequently, spending was held level for a decade. Following World War II, the picture was very different. In fiscal 1948, also after three years of peace, only 60% of the war-time spurt had been eliminated. Thereafter, spending started to rise again and is currently at the level of the war-time peak.

The "cold war" and Korea undoubtedly contributed to this new increase in Federal spending, though probably not to the ex-

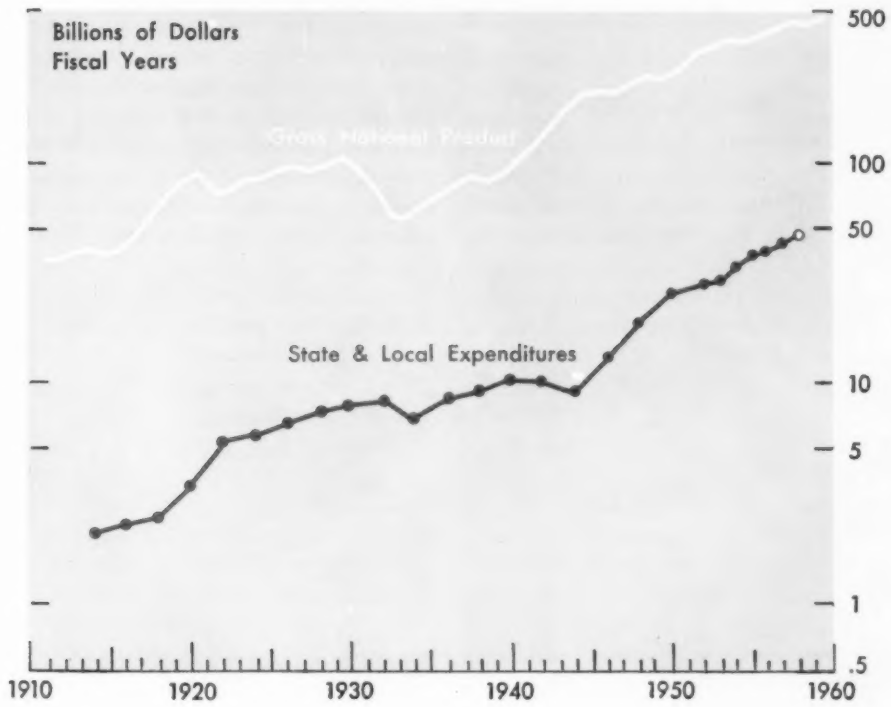
CHART 1—Federal Expenditures and GNP



tent which is generally assumed. In fiscal 1959, the aggregate cost of defense, mutual security, and interest on public debt (largely the price of national security past, present, and future) amounts to little over one half of the total $94.9 billion of Federal cash spending. More than a quarter of the total is in the area of "personal welfare" (old age insurance, pensions, veterans' benefits, public assistance and public health) and nearly 15% in other subsidies ($7.0 billion for agriculture and $6.7 billion for commerce and housing). Though it is the biggest single component, defense spending was by no means the fastest growing item in the post-war period. From 1949 to 1959, outlays for defense increased 2½ times, for commerce and housing nearly 4 times and for social insurance almost 8 times. Table I shows a breakdown of total Federal spending in 1949 and 1959 by the major functions customarily given in the official budget document.

State and local expenditures are often underestimated both in magnitude and rate of growth. As a comparison of Chart 1 and Chart 2 will suggest, they actually exceeded Federal spending for most of the period prior to 1941 and since the War have shown, at roughly half the level, a higher average annual rate of growth (9.3%) than Federal expenditures (8.6%). Comprising 48 state and over 102,000 local governments, the reporting of data here tends to lag. Preliminary figures for fiscal 1957 are the most recent available.

CHART 2—State and Local Expenditures and GNP



These put total state and local spending (excluding Federal grants) at $43.8 billion, more than 4½ times what it was at the temporary low of 1944 and nearly 2½ times the level of 1948, the first truly "post-war" fiscal year reported. As shown in Table II, the major components of state and local expenditures have in the post-war period grown at about the same rate as the total, though spending on highways alone grew considerably faster (nearly 3 times).

Combined Federal, state, and local spending in 1958 is estimated at about 30% of GNP, up from 8% in 1914. Growing economic dependence on government can be seen from data already given on areas of "personal welfare" and other subsidies. Further evidence can be gained from the fact that in 1958 governments paid, as employers, nearly a fifth of all wages and salaries and purchased, as consumers, around the same proportion of all goods and services produced.

### *Government Taxes*

BY FAR THE BULK of government spending is directly dependent upon revenues obtained through taxation. Though transferred to trust accounts after receipt, employment taxes, pension deductions and highway taxes are also in the category of compulsory government collections. Since aggregate taxes reduce the discretionary part of individual and corporate spending, their ratio to GNP is economically significant. Chart 3 shows this relationship of Federal as well as combined state and local taxes over a period of almost five decades.

As illustrated, Federal taxes generally did little more than keep pace with GNP between the two World Wars. From 1920 to 1940, their ratio averaged 4½% a year. For the period following World War II, this ratio quadrupled to an average 18%. State and local taxes, on the other hand, rose considerably between the wars while consistently exceeding Federal levies as a percent of GNP. Since 1946, state and local taxes have again grown to nearly 8%.

Dating back to the 1920's, taxes on income have been the chief source of Federal revenue. Until 1943, corporate income taxes generally outweighed individual income taxes at a 3 to 2 ratio. Thereafter a reversal occurred in that ratio, which is now fast approaching 1 to 2. Excise and related taxes have declined somewhat in relative importance but still occupy second place in Federal tax revenues. With the

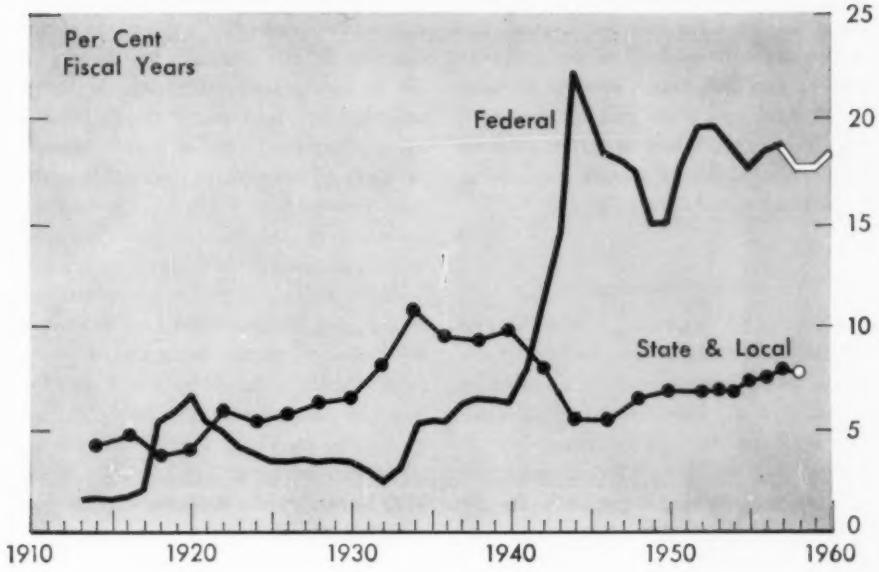
*Table I. Federal Cash Expenditures by Function*

| | *Fiscal 1949* | | *Fiscal 1959* | |
|---|---|---|---|---|
| | *Billions of Dollars* | *% of Total* | *Billions of Dollars* | *% of Total* |
| Major national security | 13.1 | *32.3* | 46.5 | *49.0* |
| Agriculture | 2.5 | *6.1* | 7.0 | *7.4* |
| Commerce and housing | 1.4 | *3.4* | 6.7 | *7.1* |
| Labor and welfare | 4.0 | *9.9* | 18.5 | *19.5* |
| Veterans' services and benefits | 7.1 | *17.5* | 5.9 | *6.2* |
| Natural resources | 1.1 | *2.7* | 1.7 | *1.8* |
| Interest on debt | 4.0 | *9.9* | 5.6 | *5.9* |
| All other | 7.4 | *18.2* | 3.0 | *3.1* |
| Total cash expenditures | 40.6 | *100.0* | 94.9 | *100.0* |

*Table II. State and Local Cash Expenditures by Function*

| | *Fiscal 1948* | | *Fiscal 1957* | |
|---|---|---|---|---|
| | *Billions of Dollars* | *% of Total* | *Billions of Dollars* | *% of Total* |
| Education | 5.4 | *25.3* | 14.5 | *30.5* |
| Commerce and housing | 5.6 | *26.3* | 13.2 | *27.7* |
| Labor and welfare | 6.2 | *29.1* | 13.0 | *27.3* |
| Natural resources | .7 | *3.3* | 1.6 | *3.4* |
| Interest on debt | .4 | *1.9* | 1.1 | *2.3* |
| All other | 3.0 | *14.1* | 4.2 | *8.8* |
| Total | 21.3 | *100.0* | 47.6 | *100.0* |
| Less: Federal grants | 1.9 | *8.9* | 3.8 | *8.0* |
| Expenditures from own sources | 19.4 | *91.1* | 43.8 | *92.0* |

CHART 3—Government Taxes as Percent of GNP




introduction of various types of social security and retirement plans, insurance trust collections grew at an average annual rate of 17% between 1937 and 1958 and are estimated to exceed $12 billion in fiscal 1960.

For the last thirty years, state governments leaned heavily on sales and gross receipts levies as their major tax source—although their individual and corporate income taxes have recently grown at a faster rate (about 10% a year in the last decade). At the local level, taxes based on property ownership have consistently provided around 90% of the total. However, local governments have also come to resort to sales and, to a lesser degree, to individual income taxes. Thus, departing from a long-honored rule of mutually exclusive taxing areas, the various levels of government have found it increasingly necessary to invade each others' territories to cope with their fast rate of spending. There are a number of items today on which in many localities the taxpayer has to pay direct taxes to all three levels of government (e.g., gasoline, tobacco, total income).

High taxes undoubtedly have a detrimental effect on free enterprise. They may divert uncommitted risk capital from areas where it is needed for the economy. They may retard the expansion of corporations, even though some of their tax burden is shifted to the consumer through higher prices. Finally, they may thwart personal ambition which might otherwise have beneficial effects on the economy.

Besides the economic burden of the aggregate amount payable, the present tax system of governments contains another basic danger where multiple taxation is applied. A double or sometimes triple attack on a single source of tax revenue tends to diffuse the responsibility for the resulting hardship so that the taxpayer has greater

difficulty in attempting to check fiscal irresponsibility. Also, multiple taxation often means levying a tax directly on a tax. Examples are a municipal sales tax on the price of gasoline, which already includes the Federal and state gasoline tax, or a state income tax which is levied even on the sizable portion of income claimed as tax by the Federal Government.

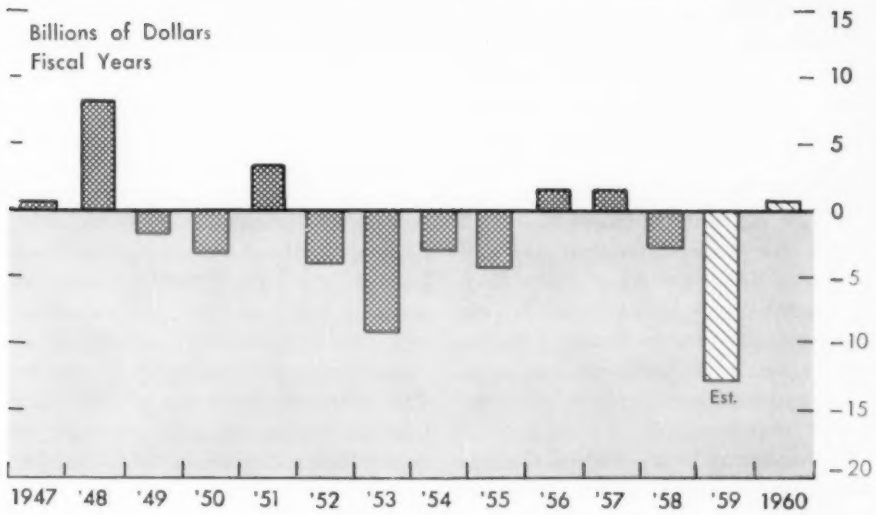
### *Debt Financing*

IN ADDITION TO TAXATION, a more limited but also less conspicuous method of acquiring funds for government spending is the issuance of public debt. There are differences between debt financing by the Federal Government and debt financing by state and local governments. In the first case, the funds obtained through borrowing can be used for any type of current spending. Furthermore, since Federal obligations are not amortized, their only current cost is the applicable interest, while the obligation of eventual liquidation is somewhat removed. State and local government debt is generally restricted in its use to capital improvements (highways, schools, etc.), and nearly always involves a predetermined rate of amortization in addition to interest payments. In either case, however, debt financing means that governments defer to later years the major burden of paying for current programs.

Chart 4 shows combined governmental debt during the last 50 years. The obvious burden of a steadily increasing debt was only slightly diluted by the expanding base of a growing population. Spread evenly, by mid-1958 every man, woman, and child owed close to $2,000 on a record $333 billion public debt. By far the bulk of this indebtedness was contracted by the Federal Government, although at the close of fiscal 1958 state and local governments carried a gross debt of $57 billion.

CHART 4—Government Debt at End of Fiscal Year

CHART 5—Federal Budget Surplus or Deficit




The year-by-year cost of such indebtedness is quite high. For fiscal 1959, interest on the Federal debt is estimated at $5.6 billion—nearly 6% of total "cash" spending. (In the "administrative" budget, which includes interest paid by the Treasury on securities held by the trust funds, the $7.6 billion shown for interest represents 9½% of expenditures.) State and local governments in 1957 (latest figures available) spent over $1 billion, or more than 2%, of their total cash outlays on interest.

It is evident from Chart 4 that national emergencies caused the biggest and fastest increases in governmental debt. The reason is that it has not been considered practicable to increase the public's tax-paying burden in proportion to the sudden needs of a major war effort. Unfortunately, little or no adjustment to pre-war levels of total indebtedness occurs after the emergency is over. Thanks to a concerted effort, the Federal debt itself was substantially reduced in each of the 11 years following World War I, resulting in a cumulative liquidation of one-third of the total. However, this was largely offset by state and local governments which in the same period resorted to more and more debt financing.

After World War II, a scant 6% total reduction in Federal debt was accomplished through 1947 and 1948, mostly by using for this purpose the larger cash balances held during the War. In the next decade, small liquidations in 3 years (1951, 1956, and 1957) were more than canceled by expansions in others. In the post-war period, state and local governments continued to increase their indebtedness at an average rate of 12% per year.

### *The Federal Deficit*

WITH RESPECT TO Federal fiscal policy, the references to public debt are nearly always within the framework of the "administrative" budget. Chart 5 shows, in this concept, the net surplus or deficit for each of the post-war years. To date, eight out of

the last 13 fiscal years closed with a deficit. The 1959 budget is expected to be $13 billion in the red while interest on the public debt will alone have cost $7.6 billion. At the same time, $20 billion was spent (exclusive of heavy trust expenditures) on "personal welfare" and other subsidies. Following the precedent of 1958 and 1959, when the original budget estimates called for moderate surpluses, the small surplus now proposed for 1960 may well turn into a deficit, particularly since Congress seems less likely to approve the proposed measures for increasing revenues (higher postal rates, higher gas taxes) than it is to authorize spending in excess of the amounts requested.

Debt financing by the Federal Government especially has an adverse effect on the economy. By borrowing heavily, it competes with business for available money and helps push interest rates upward. By not staying "within its means," the Federal Government also becomes a multiple source of inflation. To the extent that a portion of the Treasury obligations is purchased by commercial banks, which in turn can use them to increase the credit supply, Federal debt financing provides the technical basis for inflation. Inasmuch as current or anticipated inflation discourages investors from buying longer-term fixed income securities, the psychological basis is also provided for the "flight from the dollar." Moreover, if a lesser number of individual investors is willing to absorb new debt issues, the commercial banks are likely to increase their share of Treasury holdings and to acquire at an even faster rate the means by which they can expand credit. The higher ratio of bond holders demanding cash at recent refundings of the Treasury illustrates public sentiment.

Ever-growing government fiscal operations are accepted by many as inevitable. There seems to be a widespread belief that governments should intervene whenever hardships occur in the economy. Such complacency and submissiveness encourage even greater government budgets, steeper tax rates, and more public debt.

Obviously, government spending as a percent of GNP cannot continue to rise indefinitely without serious consequences. Eventually a level is reached where an economy based on free enterprise either sets a strong restrictive force into operation or simply elects to give up its freedom. The restrictive force can present itself through resolute opposition of taxpayers to any further increase in the tax burden; or it can take the form of market conditions in which governments can no longer sell their bonds at reasonable interest rates. Before reaching such a point, however, the thesis should be accepted that solvency and fiscal responsibility are not restricted to the affairs of individuals or corporations.

Inasmuch as any increase in government spending must be financed by taxes or borrowing, such increases necessarily reduce the economic incentive, as well as the funds needed, for private enterprise to expand production. And only greater production based on genuine demand will assure true growth and real prosperity. Self-restraint by public officials and vigilance by the general public are needed to prevent government finances, at all levels, from becoming an ever-increasing burden in the economy. Bell System people and, for that matter, all citizens, can do their particular shares of this civic duty if they keep well informed of the pertinent facts and make their positions known to the respective authorities.

*The scene of the confirmation of the theory of the electrical transmission of speech is restored after a lapse of more than three decades*

# BELL'S ATTIC LABORATORY IS CREATED ANEW


## EMERSON HUNT

*General Information Manager,* PUBLIC RELATIONS DEPARTMENT, NEW ENGLAND TELEPHONE AND TELEGRAPH COMPANY


ALEXANDER GRAHAM BELL'S first laboratory exists again!

The original timbers, windows, and walls stand nail by nail and knothole by knothole as they stood in October of the year 1875. The books Bell studied, the apparatus with which he experimented, the papers he worked on 84 years ago are duplicated as they were. Even the view on which he gazed from the window as he dreamed of the telephone's future can be seen again from the very window.

The exhibit was opened to the public on June 2, 1959, the 84th anniversary of the first successful transmittal of the sounds of a human voice by telephone.

Bell's original workshop, which occupied a corner of an attic at the electrical workshop of Charles Williams at 109 Court Street, Boston, is now a permanent public exhibit. Restored exactly as it was when Bell was a young man of 29, it is a part of the lobby at the headquarters building of the New England Telephone and Telegraph Company at 185 Franklin Street, Boston. Another famous tribute to the telephone industry is mounted in the same lobby: Dean Cornwell's dramatic mural painting "Telephone Men and Women at Work."

Bell's first laboratory was not the scene of the first intelligible words heard over the telephone—the famous message "Mr. Watson, come here, I want you." That first successful telephone call was made at Bell's later workshop and laboratory at 5 Exeter Place, Boston. However, the Court Street laboratory has perhaps an even more significant place in telephone history.

It was here, on June 2, 1875, that the sound of a vibrating reed transmitted over a wire confirmed Bell's theory of the electrical transmission of sound. And it was here in the Court Street laboratory on the following day that the "gallows type" telephone first transmitted recognizable speech sounds so clearly that Thomas A. Watson, listening at a telephone on the floor below, said, "I heard you! I heard you plainly! I could almost understand the words!"

As the first telephone research laboratory, the Court Street garret might be

*Bell's original workshop exists again! Plaque beneath window identifies Boston landmarks in diorama. On bench at left is plaster model of human ear; batteries at right date from 1875 – gifts from The Bell Telephone Company of Canada.*

called the precursor of the Bell Telephone Laboratories. Since most of the telephone equipment used in the early days of telephone development in Boston was manufactured in Williams' shop, 109 Court Street represented the Western Electric Company of its day. And because Bell developed the specifications and application for his orginal telephone patent here, the laboratory marks the birthplace of the Bell System.

Time and change have erased nearly every landmark associated with the invention of the telephone. The original building at 109 Court Street and most of the street itself have long since disappeared. When the building was torn down more than 30 years ago to widen a street in Boston's crowded downtown section, Matt B. Jones, then president of the New England Telephone and Telegraph Company, and George K. Manson, then chief engineer, decided that Bell's old laboratory should be saved.

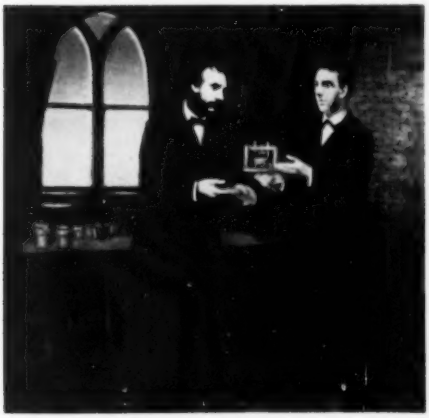
Every timber and frame was numbered, every nail was collected, and the numbers on the lumber were keyed to a master sketch of the attic workshop as it was in Bell's day. The master sketch bears the signature of Thomas A. Watson, as proof that the old laboratory was as he remembered it in the year 1875. Then the timbers and window frames and nails were stored in a Company building, to gather dust for more than three decades.

PLANS FOR THE COMING 50th anniversary celebration of the Telephone Pioneers in Boston called for some significant memorial to the Boston birthplace of the telephone. With every landmark and building gone, the restoration of the old laboratory was undertaken as an appropriate memorial to one of history's most significant events.

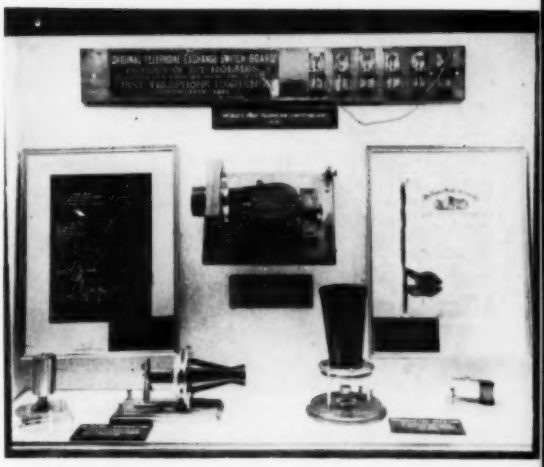
Reassembling the ancient timbers was like putting a giant jigsaw puzzle together. In spite of the care of the telephone engineers in numbering and storing the beams and boards, during the years they had been moved several times and they were covered with the dust and dirt of time. But as it stands today, the laboratory is just as Bell and Watson knew it when as young men they worked there until late at night to find a way for wires to carry speech.

Re-creating the view of Boston that Bell saw from his attic window was a task that called for antiquarians and artists. No photograph or picture exists of Boston as it appeared in 1875 from the fifth floor of the Court Street building. Most of the buildings and many of the streets that existed then disappeared long ago, to be replaced by tall structures and wider streets that have completely changed nearly every aspect of the downtown section.

Working from old city maps, and using the few remaining buildings of that period as models, a view of Boston as it was 84 years ago has been constructed as a diorama seven levels deep. The diorama alone reveals the differences between the Boston of today and the Boston of 1875. The famous Old Howard Theatre, one of the last stands of burlesque, was a church 84 years ago. Two almost legendary hotels, the Revere House and the Coolidge Building, were famous hostelries then. The Massachusetts State House, now blocked from view from downtown Boston by tall buildings, was visible from Court Street in those days, crowning Beacon Hill with its golden dome.



*Alexander Graham Bell and Thomas A. Watson in their attic laboratory at 109 Court Street, Boston, as painted by unknown artist.*



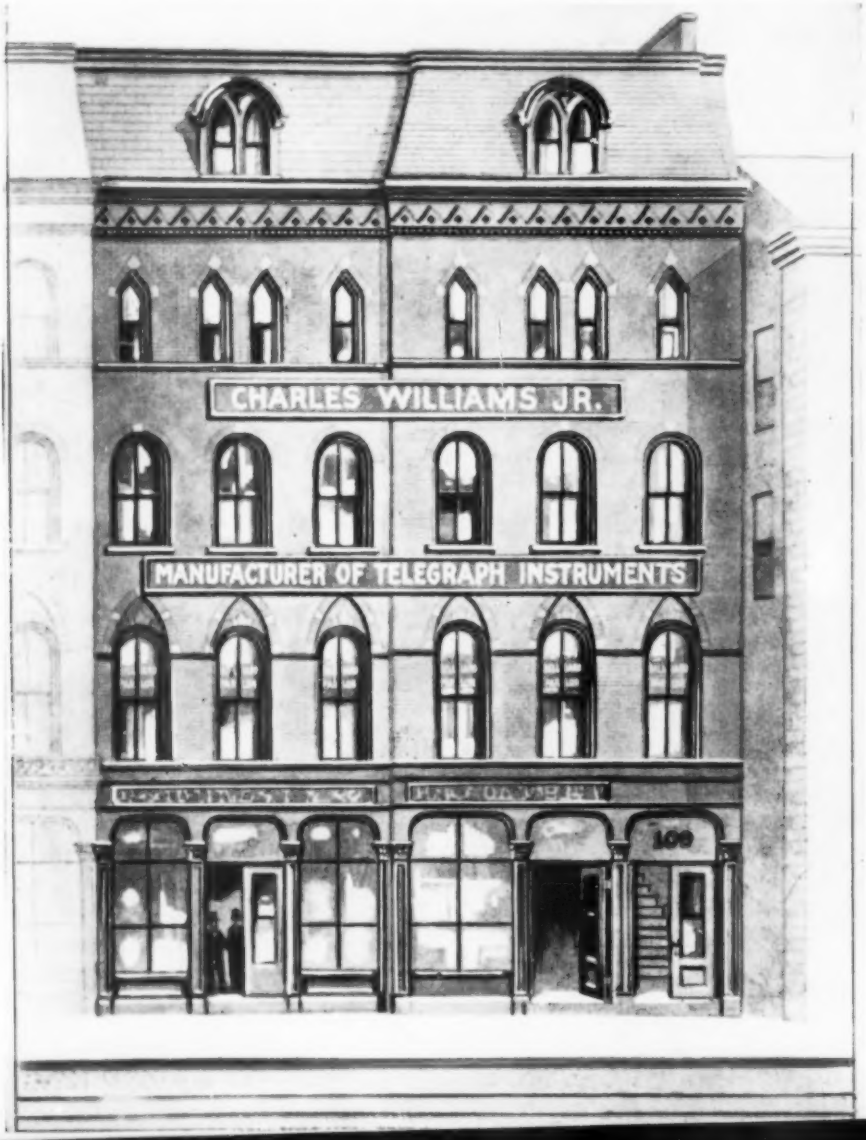
*Display case mounted in wall of original Bell workshop shows first telephone switchboard and world's first commercial telephone, as well as a copy of the original telephone patent.*

On the workbench in the old laboratory are replicas of the apparatus and equipment that Bell was working with in 1875—an anatomic model of a human ear, a "gallows" telephone, and some of the devices mentioned in his patent application. Copies of notes in his own handwriting, as he might have left them while working on his patent application, lie on the workbench.

Bell was an ardent student of physics, electricity, anatomy, and teaching, and the books shown on the laboratory shelves represent the work of another group of researchers. Each volume included is either a work mentioned by Bell, or one published before 1875 and available to him in connection with his studies.

In his testimony in connection with his patent litigation, Bell testified that he studied electricity to understand and repeat the experiments of the great German physicist, anatomist, and physiologist, Herrman von Helmholtz. Bell was unable to read German, but he testified that he was able to purchase a copy of the French translation of von Helmholtz's treatise on sound in England before he came to America. On

*Bell's first telephone laboratory was on the top floor, right, of Charles Williams' electrical shop, shown as it appeared in 1875. The double-arched window is part of the reconstruction of the attic workshop.*



*Partly complete diorama shows a section of downtown Boston as it appeared in October, 1875, from the window of Bell's attic laboratory. The diorama is in seven levels of depth.*

a shelf of the old laboratory is a copy of the French translation of von Helmholtz's volume on sound dated 1870. It was found in a New York bookshop.

BELL CAME TO BOSTON in 1871, substituting for his father, to give a series of lectures on teaching the deaf to use Visible Speech at "Sarah Fuller's School," otherwise the Boston School for the Deaf. In the following year he started to conduct his own classes for teachers of the deaf. At the same time he was developing his theory of the "harmonic telegraph," and attempting to use an undulating current to transmit the vibrations of sound over a wire.

He first visited the electrical shop of Charles Williams on Court Street after he obtained the financial backing of Thomas Sanders of Salem and Gardiner G. Hubbard of Cambridge for any inventions he might undertake and patent. Bell visited Williams to ask for help in constructing working models embodying some of the qualities of the human ear and the telegraph. Thomas A. Watson, an employee of Williams, was assigned by Williams to assist Bell, and worked with him on most of his experiments. With Williams' permission the two young men set up their experimental laboratory in a corner of the fifth floor attic of Williams' shop, and used it

for about nine months, until January of 1876, when Bell moved and set up a new laboratory at 5 Exeter Place.

In October of 1875, the period represented by the reconstruction of the laboratory, Bell had recently returned from Canada, where he had recovered slowly at his parents' home at Brentwood from a serious illness caused by overwork. According to his testimony, he was hard at work in Boston on his application for a patent—the original patent on the telephone. He filed his application on the following February 14 and the patent was issued by the United States Patent Office on March 7, 1876.

The only part of the exhibit that does not duplicate the original laboratory is a glass case in one wall, in which original early telephone instruments and apparatus are preserved. These include the very first telephone switchboard in the world—used in Boston in connection with a burglar alarm system for several banking firms. It was discovered at the Bell Telephone Laboratories almost by accident in the course of research for the exhibit.

THE RE-CREATION of the dingy original workshop of the inventor of the telephone provides Boston with something it has long lacked—a suitable monument to one of the world's most significant inventions.

Visitors today may stand in the same surroundings where Bell stood 84 years ago, gazing out over a busy city that relied wholly on the telegraph, semaphore, and messengers for fast communications. Here they may recapture some of the vision that led Bell to carry his theories through to proof and success.

Above the ancient, bare attic room, assembled in the building's lobby, is the complex system of modern telephone equipment that serves as a long distance telephone switching center for all of New England, and through which voices pass to and from the most remote corners of the earth. Crowning the building, 21 floors above the little workshop, are the great radio antennae that carry voices through the air to distant points just as cables carry messages underground.

It is especially appropriate that the room in which the telephone was conceived should be a part of one of the most modern and completely equipped telephone operating buildings in the country. Immediately above the old laboratory, at the entrance to the headquarters building, the blue and white standard of the Bell System is a visible symbol of the realization of the dreams, the study, and the work of an imaginative young scientist in a dusty attic more than eight decades ago.

*As his Bell System career draws to a close*
*the author reflects*
*on his experiences and recollections during*

# THIRTY YEARS OF CHANGE


## JOHN M. SHAW

*Assistant Vice President*, MARKETING DEPARTMENT, A. T. & T. CO.


WHEN I CAME TO 195 Broadway many years ago looking for a job in public relations, Vice President Arthur Page asked me what I meant by public relations. "Everything," I said, "that has to do with interpreting the public to the company and the company to the public, plus watching all company operations to be sure they are such as will bear public scrutiny and merit public approval."

"That doesn't sound easy," said he. "In fact, it could get you into a peck of trouble."

Trouble or no trouble, I shortly went to work in what we then called the "Information Department." The name puzzled me. "Information" to me meant providing telephone numbers not yet in the directory. For this I had little talent and less experience, so I was relieved to find that "Information" actually was Telephonese for the kind of job I had described to Arthur Page. We didn't call it "Public Relations" because, among telephone people of that era, this term was a little less than respectable, and a good many years had to pass before it came into universal use.

Yet while the name was new, public relations itself was old. Theodore N. Vail, when he headed the Bell System in the 1880's, had urged that good relations with the public be the rule in all matters of service and rates. Advertising man Howard Stokes, then of the New York Telephone Company, in 1912 had coined the slogan "The Voice with the Smile" to dramatize the Bell System's public-mindedness. And A. T. & T. President Walter Gifford in 1927 had enunciated his famous "Dallas policy" with the words "the most telephone service and the best at the least cost."

The change that has come about in our time is the full recognition that public relations is an activity of the business that must be planned like any other. Today PR has a prominent place on Bell System organization charts, and not a few of the men who have headed public relations departments in the last two decades have moved up to be presidents of Bell companies.

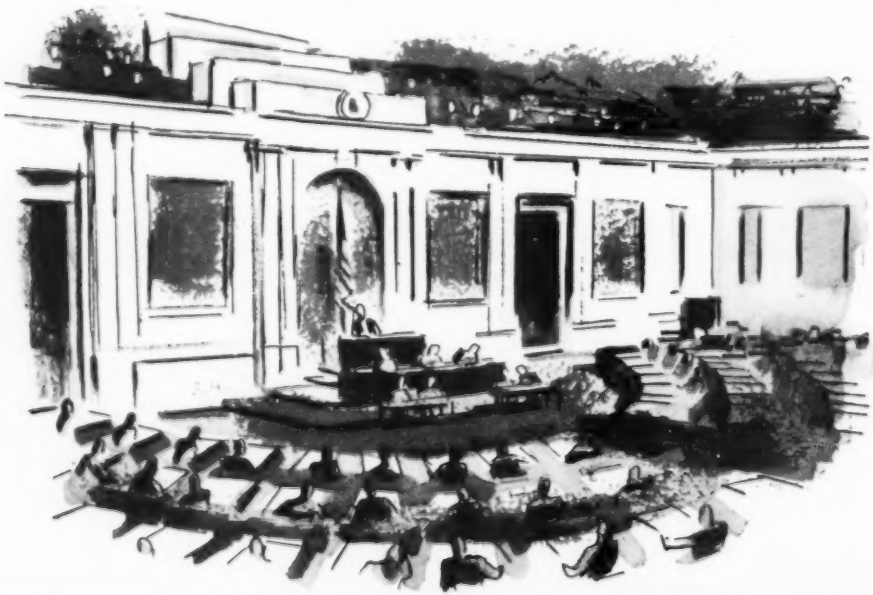
More recently, Mother Bell has presented PR with a little brother called PA—for Public Affairs—which President Kappel has described as "bringing about better relations between ourselves and our representatives in government." This also represents a change, if not in direction at least in emphasis.

ONE OF MY FIRST PR assignments was to go to Washington, study the political scene there, and recommend what might be done to get better understanding in the nation's capital of the Bell System's aims and practices. After much soul-searching I recommended that nothing be done. To do something special might bring more misunderstanding than it could remove.

In the light of coming events, this seems incredibly stupid. I can only say that the coming events did not cast sufficiently strong shadows before. There was then no Federal Communications Commission, federal regulation being just a gleam in the eye of a few of the more liberal Congressmen. There was no Securities and Exchange Commission keeping a watchful eye on all capital financing, including ours. There was no National Labor Relations Board serving as a potential mediator between the Bell System and four-fifths of its employees. There was no Defense Department, for the nations were disarming after fighting a war to end war. With the corporate income tax at the low figure of 12%, the U.S. Treasury was still very far from being the majority partner in Bell System profits that it has since become. Nothing was farther from our minds than a federal excise tax on telephone service.

There is so much of the Hamlet in all of us that we would "rather bear those ills we have than fly to others that we know not of." Each of these changes we viewed with no little foreboding. None was really welcomed. Some we actively opposed, and others we passively hoped would not transpire. But as each became a way of life, we were flexible enough to adjust to it. A new generation is arising that knew not the old days; that has learned to accept those changes that we think are good, while resisting with renewed vigor those we think are bad. The passing generation has learned to expect that, as private enterprises grow big, the government procedures that control, guide or serve us all will

*"Another major change . . . the evolution from manual to dial as the method of handling telephone calls. This has not been without its rough spots. . . . Senator Carter Glass of Virginia resented being asked, as he put it, to do the manual work of a telephone operator, and made a fiery speech on the Senate floor objecting to dial phones in the Senate Office Building."*



also grow big. As for taxes, the struggle against excessive taxation has throughout history been the lot of the successful enterprise.

All these changes having come about, it is now difficult to see how the Bell System could function smoothly without a well-staffed A. T. & T. Washington office under top executive direction. This closer tie between company and government is, I think, the most significant change in my time.

Another major change that our generation has seen is the evolution from "manual" to "dial" as a method of handling telephone calls. This has not been without its rough spots. When dial was new, Senator Carter Glass of Virginia resented being asked, as he put it, to do the manual work of a telephone operator, and made a fiery speech on the Senate floor objecting to dial phones in the Senate Office Building. This caused great consternation in the Bell System, and sent us scurrying to our typewriters to explain the reasons for dial in simple terms.

My contribution in this crisis was a hurriedly prepared paper, copies of which may still be found, yellowed with age, in various files to which they were consigned after being distributed by A. T. & T. The facts and figures were the work of a young engineer in Washington named Eric Greenleaf who is now chief engineer of the Maryland company. Eric will not have forgotten how he and I labored to the point where his only remaining criticism of our joint effort was my insistence on the right to use a split infinitive. We had set ourselves to answer three questions that had been raised about the ultimate effect of dial on the quality and price of telephone service and on employment.

When these questions were phrased, the answers had to be set forth in language as persuasive as possible, from facts yet to be proven. Today the questions provide their own answers. The prophetic promises of Eric Greenleaf and his fellow engineers have been richly fulfilled in a dial system that extends to 90% of all local calls and the range of which is being rapidly expanded. Service is faster and more accurate, and calls have been multiplied three-fold. The price of telephone service has been kept low through depression, war, and boom, and despite increasing costs and huge capital expenditures. The telephone gives employment, directly or indirectly, to more people than ever before. Indeed, the steady march to dial operation, slow-seeming in terms of months but rapid in terms of decades, is one of the great revolutions of the American economy. Every facet of our society has benefited, and each of us in our generation can say with becoming pride and in Aneas' words "All of this I saw, much of it I was."

The Carter Glass eruption no doubt delayed the System's dial program somewhat. It seemed to me at the time it was entirely due to our failure to see that he and his fellow-senators had the straightforward facts as we saw them. It is by just such experiences that we learn the simple truth that the facts that lead management to a decision are likely to be our best reliance in convincing the public that the decision is a right one.

About the time of the Carter Glass incident, one of our Virginia cities was going dial, but this was "hush-hush" information because we didn't want a neighboring rival city to know about it. Inevitably, of course, a roving reporter got the news. Before long the entire population, led by the city fathers, wanted to know why the telephone company thought town A was any better

*"Some words spoken by Emile Zola burned into my mind . . . I called the printer, had him make up a dozen cards, put them on the desks of my subordinates."*

than town B. While still smarting from this harrowing experience, I saw the motion picture "The Dreyfus Case." Some words spoken by Emile Zola burned into my mind, and the next morning I called the printer and had him make up a dozen framed cards. I put them on the desks of my subordinates and said "I don't usually give firm orders, but this is one! Keep this always on your desk and do obeisance to it every morning before you take your hat off. Be guided by what this says, and if you find anyone acting otherwise, from the president on down, see me at once." I don't know where the other eleven cards are now, but one has been continuously before me ever since. It reads:

> TO MISS AN OPPORTUNITY TO TELL THE TELEPHONE STORY—THAT MAY BE FORGIVEN US.
>
> TO LET A NEW IDEA LIE IDLE—THAT CAN BE OVERLOOKED.
>
> BUT IT IS INEXCUSABLE TO FORGET THE WORDS OF ZOLA:—
>
> *"When truth is driven underground, it grows and grows in darkness, until at last it gains prodigious strength. And when it bursts forth it shatters everything."*

MY TEMPORARY ASSIGNMENT in Washington stretched into a tenure of six depression years, during which our major objective was to hold the revenue line against the loss of telephones—or "stations" as telephone people prefer to call them. My first serious exposure to Telephonese lingo was my attempt to answer the question "How's your station gain?" This was in those days the equivalent, among telephone folk, of "Howdy!" or "Looks like a nice day!" I never did become adjusted to it, for to me a station was, and still is, a place where people wait to get on a train or a bus. Nor could I quite understand why "stations" should be the unit of measurement of all things telephonic. In the transportation business, where I grew up, the chief unit of measurement had always been the passengers carried and not the cars or the tracks that carried them. So in attempting to promote transportation revenues, I had always done so by trying to get more passengers, or "rides." We would inevitably need more cars or buses to carry them, but this was a by-product rather than the main objective. So in attempting to improve telephone revenues, I naturally thought in terms of "calls" rather than the telephones and wires that carried them.

It is a tribute to the patience of Mother Bell with her wayward children that all such off-beat ideas are not squelched, but are exposed to the elements either to flourish or be destroyed. And so I was invited to air my radical views before the 1934 conference of Bell System public relations executives in a paper which bore the title "Usage as an Objective of Telephone Advertising—Based on Experience of Chesa-

peake & Potomac Companies." The reaction of these hard-bitten men, all my elders in years and telephone experience, might be described as one of courteous but cold disagreement. My own impression was one of shocked surprise, and the paper was relegated to the musty files from which I have just exhumed it.

On re-reading this controversial 25-year old document, my impression is still one of wonder that there should have been such disagreement. In any such group today the ideas in these paragraphs would get much more acceptance:

"The principle that has been guiding the advertising policy of the C&P companies is easily defined. It is simply the development of our advertising programs with an eye to securing the greatest possible use of the telephone as the best means of influencing present revenues and the permanent expansion of facilities. In other words, we are selling calls rather than telephones . . .

"Regardless of what we as advertisers may feel we are selling, there is no question as to what our customers think they are buying. They are buying, and are willing to pay for, a certain number of telephone calls. To get them, they must install one, two, or more telephones on their premises, and must be sure that those they wish to talk to have telephones too. But the value of this physical equipment is almost entirely dependent on the extent to which the customer makes use of it. And its power to produce permanent revenue for the telephone company is likewise dependent on this use.

"Our analysis of our advertising and the market leads us to believe that the immediate result of our advertising, regardless of its objective, has been the stimulating effect it has had on the daily use of the telephone. The influence on station development is an indirect rather than a direct one. If that be so, then the best unit by which to measure the effectiveness of advertising seemed obviously to be not the station, but the call . . . The very development of usage leads to a cumulative growth in volume, which not only brings immediate revenue to the telephone company, but is the only solid foundation on which to build a permanent physical plant.

"A simple method of measuring the revenue effect of flat rate calls has been worked out and approved by the management of the Washington company. That company is called upon to handle 250 million telephone calls a year. For this service the people of Washington pay approximately $9 million. Each call on the average costs the telephone users on this basis about 4c . . . If, by accident or design, so

*"The value of the telephone is almost entirely dependent on the extent to which the customer makes use of it. And its power to produce permanent revenue for the company is likewise dependent on this use."*

many calls should be stimulated as to increase by 1%, or 2,500,000, the number of calls handled throughout the city in a year, the permanent annual revenue from these calls would closely approximate the average of 4c per call which prevails in the case of the entire volume of calls being handled by the company."

The paper went on to enumerate and describe the channels through which increasing calling volume improves revenues, aside from the obvious increase in local message charges where these exist. Among these are the stimulus to residence development and the prevention of disconnects, the favorable effect on extension growth, the influence on long distance and public telephone revenues, the urge toward upgrading of the classes of service and, perhaps most important of all, the effect that the growing volume of calls from all sources has on the switchboard and other facilities of the business users, payment for which constitutes perhaps the more profitable part of our revenues.

All through my years in the telephone business, and no doubt long before my time, the subject of this paper has been a matter of divided opinion among telephone people. Some have held that to add to calling volume is to increase expense at a faster pace than revenues. History, it seems to me, teaches otherwise. The average American who made 192 calls a year when that paper was read now makes 473 calls a year. The 20 billion calls of 1934 have mounted steadily and are now at the rate of 65 billion. Month by month and year by year as this calling volume has grown, the customer facilities needed to handle these calls have kept pace and revenues have grown with them. This is at the root of our current prosperity as an enterprise. Should the trend of telephone use begin to turn downward, the prosperity of our enterprise will turn downward with it.

*"WEather 6-1212 was established and hasn't missed a beat in twenty years."*

As I go into oblivion, and the battle of the conference table knows me no more, I am glad that I have persisted in my early conviction that above all else we must keep calling volume on the rise. And I am full of appreciation for the good spirit of my associates who have encouraged an atmosphere in which so non-traditional a concept could be voiced, whether or not agreed to.

As THE YEARS WENT ON, I became more and more convinced that two basic facts underlie the success of the Bell System. The telephone is a habit-forming thing, like tobacco or morphine. And the breeding power of telephone calls—their capacity to reproduce their kind—is so great as to defy all calculation. I came to believe that we should constantly seek to promote new uses of the telephone. And so when pressure began to develop for a Weather Information service by telephone in New York City, I was one of those who believed it should be provided. Against us were arrayed the usual set of "cons" which always

outnumber the "pros" in any new project. Chief among them was the fact that the traffic engineers could not see more than 1,500 such calls a day, whereas we must have 3,500 to justify the substantial investment in equipment.

A simple survey of the market indicated that weather calls would actually outnumber calls for the already existing Time-of-Day service. But since that service was completing 50,000 calls a day, we dared not submit the results of the survey but did say there would be more than required by the engineering estimate. WEather 6-1212 was in due time established and hasn't missed a beat in twenty years. The first year 20,000 calls a day were completed and in the course of time the volume of weather calls caught up and passed the time calls, validating the results of the survey that we ourselves lacked the courage to believe in. Ten cities now have weather service and last year 175 million calls were made for the taped weather report. When the usage concept I have described is fully accepted, all cities will have not only weather service but many other kinds of mass information that can be provided by modern recording.

For every ten attempts to make a local call in 1935, two failed to be completed. Either the phone was busy or no one was there to answer it. The mounting use of the telephone put such a load on the system that by 1958 three attempts out of ten failed to be completed. Technology and marketing will reverse this trend as the promotion of calling volume becomes their main objective.

In the course of time, the only reason for a telephone to go unanswered will be that the person called doesn't want it answered. Why will this be so? Because the public will want it so, technology will permit it and it can be done at a profit. Telephones will be so numerous that one will always be in easy reach. No one will have to share his telephone with his neighbor. Every living space in every home will have a phone and they will be in all automobiles and airplanes. When no one is near a ringing telephone, a machine will answer it. When the line is busy, a tone will say "another call is waiting."

The urge to expand telephone usage leads one naturally to be concerned about the telephone number without which no call can be made. It has been my dream that the day would come when the American's telephone number would become an integral part of his street address. Progress toward this goal has been slow. Indeed, the means by which the users acquire the numbers they use are essentially the same as when I came into the business. We have not yet found the way to apply the many advances in the graphic arts and in electronics to the all-important job of making telephone numbers more readily available to the users. The present methods will not fit a world in which anyone can dial anyone else anywhere. This is now recognized and a research group has begun a "number services" project that I predict will not stop until, in some distant year, the wanted number will appear visually before the user on his telephone instrument.

WHEN WE HIT the fifteen million mark in telephones, it seemed to many of us that we were approaching the point of saturation. Now that we are serving 55 million, we know that saturation is just another name for stagnation. Growth we will have so long as we have vitality, and with growth comes the need for more and better leadership.

I remember Leroy Wilson, soon after he became president of A. T. & T., telling the share owners that his biggest worry was

*"He has never swerved from his belief that public attitude could be measured with mathematical precision."*

finding qualified leaders for our expanding business, and the closer to the top, the harder it was to fill the jobs. When a few years later Cleo Craig became president, we immediately began to hear about the need for moving the decision-making power farther and farther down the line. This decentralization of authority was needed, he said, to meet the coming demand for trained top leadership in management.

The day is long since past when the Bell System hired a likely-looking college graduate, preferably with an engineering degree, assigned him to a specific department, and turned him loose, hoping he would emerge twenty years later as another Vail or Gifford. Now we indulge in schemes of cross-pollenization between departments, in special college courses for the younger executives, in week-long training sessions in which the higher levels are exposed to the best thinking in such fields as sociology, economics, finance, marketing. All this has as its aim the improvement of individual leadership, but perhaps its greatest value is the influence it has on the entire working force. It clearly says that those who supplement their telephone skill and knowledge with the attributes of the fully-rounded life have a better chance of moving rapidly upwards in our highly competitive hierarchy.

This emphasis on competent leadership-in-training is one of the more important changes in my time. It makes it hard for those of us who have spent a lifetime within the Bell System to be patient with those best-selling sociologists who see the world of organized business stifling the individual innovator.

Much closer to our experience is the comment of my ex-boss, Keith McHugh, former president of the New York Telephone Company and himself an innovator of no mean stature. He has pointed out that the need to conform to the team spirit has given the individual innovator more—not less—opportunity for the happy and productive exercise of his talents. Convincing evidence of this is America's economic development in the last decade. To be an innovator takes a measure of skill and courage of which there has never been an over-supply in any human society. Yet surely these free and restless spirits would be more quickly stifled in the bare garret of our grandfathers' time than in the well-equipped laboratory or well-staffed offices of a business organization that lives and prospers by innovation.

But the sociologist might reply that McHugh has worked in the field of administrative management and not in what might be called the learned professions.

Consider then the case of Ted Smith, general statistician of A. T. & T., whose work in mass psychology I have been in position to observe from the first year of my Bell System employment. He has never swerved from his belief that public attitude could be measured with mathematical precision. With infinite patience and tact, and with great professional integrity, he has gone about proving this point by throwing light on numerous quirks of human habit or opinion as they influence the day-to-day jobs being done by his operat-

ing associates. Because of his individual work within the team, the Bell System now has before it at all times reliable knowledge of how telephone users in all communities feel about telephone service, rates, and practices generally.

Ted Smith has guided this research project and leaders who, like Keith McHugh, believe in individual initiative, have underwritten it. As a result, public attitude measurement has become a most helpful tool of the business, in constant use in measuring our effectivness, and in the development and marketing of Bell System services. I would rate this growing recognition of the social sciences as one of the more important changes I have seen, although its greatest application lies in the future.

THE FINAL CHANGE of which I would speak is the one of which it has been my privilege to be a part during my final years of Bell System service — the vigorous marketing, for the first time in many years, of the telephone and its use.

The story of the war was one of shortages—physical and human. Telephone materials and men were on the battle front and behind the lines as well, and civilians just had to wait. The war over, we fully expected that within a few years we would catch up and resume our pre-war rate of progress. We reckoned without the increased popularity of our product. Year by year, people wanted more telephones than ever and made more use of those they had. Billions of dollars' worth of physical plant had to be provided at greatly inflated costs. Thousands of new employees had to be hired and trained at constantly rising wage levels.

*"We are in a transition stage that extends to the farthest reaches of the Bell System—a change from the passive policy of 'meeting demand' . . . to the active policy of 'aggressive selling' that is the essence of the American business way of life."*

There are three ways by which a business can protect its net income against rising costs. It can introduce economies by efficiency in operation and technological improvements. It can promote vigorously those products or services that give promise of a good profit. Or it can increase its prices. The first of these the Bell System has done to an enormous degree through mechanization of its local plant and later of its long distance network. The third it has done only as necessary, and then with great reluctance. The second it couldn't do without adding further to a demand that it was in no position to supply.

Toward the end of the first post-war decade we began to get our heads above water. Raw materials were coming into good supply. Our manufacturing capacity had been built up. Home telephone service had reached the high mark of 80% and the proportion that had to share lines with their neighbors was falling. Long distance calls were being handled with few delays.

At this point Bell System management was confronted with a decision of great import. We could now drift along, meeting the demand for telephone service as it arose. Or we could resume the vigorous promotion of the telephone and its use.

The first alternative seemed quite attractive, but had certain serious objections. It would sap the organization of the vigor that had built it in its early years and preserved it in its maturity. It would make us a prey to the competition that had entered the communications field since the war, and that might increasingly be in position to take the more profitable share of the market — leaving to us, as the common carrier, the less profitable share. Moreover, it was contrary to the spirit of service we had inherited from an earlier generation.

Both our prosperity and our ultimate preservation argued strongly for the second course. To get us on that course a Merchandising (now Marketing) Department was formed under Bartlett T. Miller, then Public Relations vice president and one of our most experienced and respected leaders. The marketing functions of the telephone companies have since been reactivated and strengthened. New products and services are being planned and market tested — some already successfully introduced. Studies are under way to determine the more profitable areas of promotion, and these are serving as the basis of aggressive selling. The well-telephoned home is a recognized goal of the business, and plans are being laid for the greater use of the telephone network at hours when it would otherwise be idle.

In short, we are in a transition stage that extends to the farthest reaches of the Bell System — a change from the passive policy of "meeting demand" forced upon us in the war and post-war period to the active policy of "aggressive selling" that is the essence of the American business way of life. The change is already showing results.

THE CHANGES I have observed and have attempted briefly to describe are certainly dynamic. Some might call them revolutionary. Yet in retrospect I for one seem not to have been conscious of change going on around me. Often indeed the process of change has been disconcertingly slow. It is as though we were hung suspended in time. The sensation is not unlike that of an airplane flight, where there is no impression of movement even when speeding at hundreds of miles an hour.

So my word as a has-been to the yet-to-be's is simply this. Never for a moment think that the state of things is unchanging, and don't be too sure that progress is slow! A look along the road you have come may reveal that you're going like the wind!

*Nearly 600,000 employees of Bell System Telephone Companies are concerned with preventing off-the-job accidents as well as injuries while they are at work*

# SAFETY AROUND THE CLOCK– A BELL SYSTEM OBJECTIVE

MARGUERITE E. McCABE

TRAFFIC DIVISION, OPERATIONS DEPARTMENT, A. T. & T. CO., and

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Nearly one out of every three hospital emergency-room patients is an accident victim, according to the National Safety Council. Included are accidents occurring in the course of employment and all others as well.

As far as the workers are concerned, available statistics show that they are far less safe when NOT at work than when they are on the job, despite the hazards which their employment may involve.

Among the working population, off-the-job injuries total 2½ million a year, causing 55 million days of disability.

Deaths among this group, resulting from off-the-job accidents, total 32,000.

The multi-billion-dollar cost of off-duty injuries to the nation's workers is borne by employees, their families, and industry.

THIS IS THE STORY of what the Bell System is doing about the problem of off-duty accidents. It tells of the concern of some 600,000 employees for safety at all times and in all ways. It reflects also the problem and activities in other telephone companies associated with the Bell System, which have over 50,000 additional employees.

Telephone people's concern about off-duty injuries is well founded. Last year 21,000 of their fellow employees were disabled for an average of 14 days each. It is tragic that 137 of these injuries were fatal.

True, when these accidents occur the employees are not at work, and industry's responsibility for their welfare might seem not to exist. However, the attitude of the Bell System differs in this regard. The supervisor is concerned about his people at all times. If the employee has illnesss in the family, or is disturbed by a problem, the *good* supervisor is interested, keeps informed, and tries to help. So it is with accidents—on and off the job.

One telephone company executive expressed it this way:

*"Our people will be just as aware of their own safety—on or off the job—as we, as*

*supervisors, indicate our interest and so demonstrate."*

Until a few years ago, the Bell System (like most other industries) concentrated almost entirely on preventing work injuries. Between 1944 and 1952 the work injury rate per million hours was reduced from 3.5 to 1.0. In the subsequent years the rate has continued to improve to an all-time low rate of .59 for 1958. This rate is ten times better than the average of industries reporting to the National Safety Council. It has been achieved by employees who are exposed to injury in many ways. They climb poles, handle heavy equipment, work in close proximity to power wires, operate some 87,000 motor vehicles, and maintain service under all types of adverse weather conditions.

Meanwhile, some startling facts were learned about off-the-job accidents. Absence-control studies revealed that such accidents contributed substantially to the absence problem. Records of off-duty injuries kept by several of the telephone companies showed that they occurred many times more frequently than work injuries. In some instances the ratio was as much as 40 to 1. Moreover, the rate for women was found to be higher than for men. This is especially significant, because there are 341,000 women in the telephone companies, and they account for 58 per cent of all the employees.

Such findings made it clear that, despite all the work that had been done to prevent accidents on the job, this was just not enough. Rather, there was an obvious need to recognize the gravity of the off-duty accident situation, and to take specific action to prevent these accidents from occurring.

It is still too soon to speak much of the results. However, it is known that improvement has been achieved in some of the companies. One whose off-duty activities have been particularly noteworthy can point to an improvement of 40 per cent in the number of injuries. Motor vehicle accidents among women in another area were reduced 20 per cent. Of real significance is the improvement of on-duty accident rates as well.

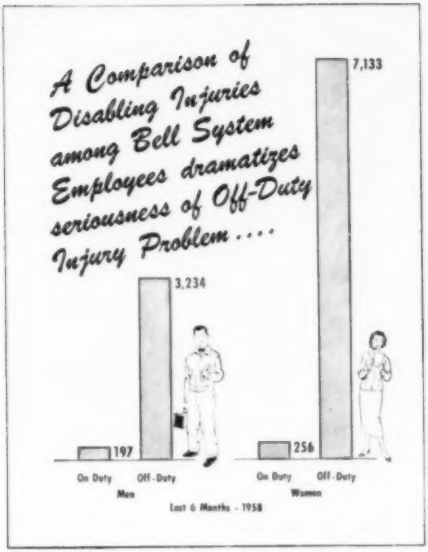
SAFETY IS NOT AN ELECTIVE
DOCTORS' BILL
INJURY SUSTAINED AND PAIN SUFFERED BY EMPLOYEE
LOSS OF PRODUCTIVITY
CONTINUING EFFECTS ON EMPLOYEE – COST OF TREATMENTS – INABILITY TO ENJOY RECREATIONAL AND SOCIAL ACTIVITIES
EFFECT ON FAMILY AT TIME OF ACCIDENT
SHOCK TAXING CARE OF INJURY
INVESTIGATING ACCIDENT, MAINTAINING RECORDS, PREPARING REPORTS, KEEPING EMPLOYEE ON DISABILITY ASSIGNMENT, ETC.
PERMANENT EFFECTS ON EMPLOYEE
PHYSICAL BREAKDOWN OR BREAKDOWN OF MORALE
DISFIGUREMENT
LOSS OF EARNING POWER
MEDICAL DEPARTMENT
EFFECT ON MORALE OF OTHER EMPLOYEES
INCONVENIENCE TO FAMILY AND FRIENDS

*The iceberg demonstrates that many of the costs of accidents are hidden. Just as most of the iceberg is below the surface, the greater portion of the effects of accidents are not readily visible.*

### *Activities Among Women*

AN IMPORTANT STEP from a System point of view was taken in 1955 when a meeting of women was held in New York. They were experienced in safety work and represented a number of the telephone companies.

One of their principal recommendations was to develop a reporting procedure for all disabling off-duty injuries involving women of the department they represented. These reports would provide the basic facts and indicate the proportions of




the problem. Further, this would allow all of the companies to be kept informed of the results.

The group also felt that in dealing with the problem as concerns women, programs keyed to their particular interests and needs were imperative. For example, in order to gain and hold a woman's attention, emphasis should be on the broad responsibilities which many women have. It is understandable that when an accident occurs to a woman the repercussions can be many, since the normal routine of each member of her family may be affected. This appeal to the emotional side of her life is one to which women respond. It is the basis of many of the activities that have been developed.

Further, the need to get the maximum benefit from good ideas was discussed by the group. A recommendation was made for a procedure that would permit information about such ideas, developed in one place, to reach all others.

In carrying out this recommendation, advantage has been taken of expanded activities in all departments. As a result, the astonishing number of 600 pieces of material, developed in the field, and dealing with off-duty safety alone, have been collected and distributed to all of the companies. This collaboration is an outstanding display of the real effort and sincere concern of telephone people everywhere to control off-duty accidents.

### *The Systemwide Approach*

Another example of interdepartmental action followed the discussions in a conference of Bell System executives where agreement was reached that a method should be developed for reporting off-duty injuries for all departments, systemwide. After studying the plans used by some of the departments, several of the telephone companies, the National Safety Council and outside industry, a report was introduced in 1958 entitled "Recording and Measuring Off-Duty Injury Experience." It provides for the reporting of all disabling off-duty injuries in all departments.

The practice and the information derived from the reports provide the basis for the administration of the Bell System's off-duty safety activities. It has also increased interest in the problem and stimulated interdepartmental off-duty accident prevention.

Significant information about each such occurrence is recorded under the three broad categories of transportation, home, and public. All off-the-job accidents are classified in precise detail. An injury frequency rate per million hours of exposure is then computed. This allows a comparison with on-duty injuries, which are expressed in the same terms. A special report is received on off-duty fatalities, and a "Summary of Off-Duty Injuries" is issued

quarterly to the companies, using these data.

Statistically, about 25 per cent of all the accidents are classified as transportation accidents, 40 per cent are home, and 35 per cent are public.

### *Defensive Driving*

ONE OF THE MOST SERIOUS PROBLEMS facing the American people today is that of injuries resulting from automobile accidents. While not quite as numerous as home accidents, more people are killed and seriously injured in the United States in motor vehicle accidents than from any other cause. More than 612,000 Americans have been killed in such accidents since 1940—more than the battle fatalities of all the wars in the nation's history.

What is the answer? Safe driving, of course, by every one who drives an automobile. Safe driving is made up of many things, one of the most important of which is the attitude of the driver. This is the key to the Bell System's Defensive Driving program. Defensive Driving is aimed at developing the proper attitude of the driver toward himself and toward other drivers. It teaches him to be careful to commit no driving errors himself, and to be alert for the lack of skill or judgment or the im-

*A report on every off-duty injury is prepared locally as outlined in "Recording and Measuring Off-Duty Injury Experience." A summary of these cases is compiled quarterly by the company or area and forwarded to the Operations Department at A. T. & T. From these summaries a Bell System report is prepared and distributed throughout the operating companies.*

*Safety is stressed as women employees participate in "Powder Puff Mechanics," an out-of-hours course of basic mechanical information.*

proper attitudes of others. The Defensive Driver will not allow such things as weather, road conditions, or the absence of signs or signals to involve him in an accident.

Since Defensive Driving was introduced in the Bell System some ten years ago, many of the companies have reduced motor vehicle accidents by 50 per cent.

Unfortunately, it takes more than Defensive Driving by the employee to prevent some of the motor vehicle accidents in which he is involved. Sometimes he is involved in an accident which he could not have prevented. The answer, then, is to get others to drive defensively.

With this in mind, one of the western companies began to get other fleets interested in this training. They offered the Defensive Driving program to a pilot community of 20,000, through the local safety council. The results showed what could be accomplished with teamwork between the telephone company and the city and other business organizations.

Nineteen groups asked to participate. The telephone people trained instructors from each group. These new instructors, in turn, trained their own people. The program got off to a good start—2,000 drivers were trained in the first three months.

This venture proved so successful that employees of other telephone companies in various sections of the country adopted the idea of promoting Defensive Driving in the communities where they live. In doing so, the streets and highways are made safer not only for residents of the community involved but for telephone people and their families as well.

### *Family Safety Nights*

A SAFETY PROGRAM that plans to prevent injury to the employee during off-duty hours requires particular attention to the home front. This is where most of these hours are spent and where most off-duty injuries take place. In order to make homes hazard-free, each member of the family must be responsible for safeguarding the others. To accomplish this requires that every one be educated and motivated.

In other words, the whole family must be trained in what they can do about physical hazards created by poor housekeeping and building conditions and unsafe habits and practices. If children and old people increase the accident potential in the home, special training is needed.

The Family Safety Night is a company-sponsored gathering for employees and their families. It is considered the fastest and surest way of projecting safety into the home. It is possible that these affairs provide a first occasion for the family, as a group, to be together for the sole purpose of promoting safer living.

It is not uncommon, following Family Safety Nights, for family members to pledge themselves to the role of "Safety

Supervisor." When this happens, industry has made great headway toward an off-duty performance that is comparable to on-duty.

### *"Charlie's Haunt"*

STILL ANOTHER GOOD EXAMPLE of the system-wide interdepartmental approach is the Bell System movie, "Charlie's Haunt," in which safety ideas of all departments were coordinated. The picture was produced in Hollywood and was released in 1958. "Charlie's Haunt" is devoted primarily to promoting off-the-job safety. Included in the cast are Edgar Bergen, Charlie McCarthy, and Don Wilson.

In the picture, men and women employees of the various departments are shown performing their work safely; but away from the job they engage in similar activities with much less regard for safety. As the story unfolds, Edgar and Charlie, in their inimitable way, keep emphasizing the basic theme of "taking safety home." While it is reasonable to expect that this will be done, the fact that it is not is well illustrated by the much larger number of accidents that occur to employees when they are off the job. Other Bell System safety films with interdepartmental appeal which have been widely and successfully shown are "Jack and Jill" and "Seven-tenths of a Second."

Both "Charlie's Haunt" and "Seven-tenths of a Second" this year received

*The paradox behind many off-duty accidents is the theme of the Bell System film, "Charlie's Haunt." Joel, an employee whose work has taken him up and down ladders every day for years, falls and is injured when he uses one at home.*

*Safety contests for children of employees create greater family-wide interest in safety. The pride of this winner of an essay contest seems to be equalled by his parents and the company official who presents the award.*

Award of Merit certificates from the National Committee on Films for Safety."

### *First Aid*

FIRST AID TRAINING exerts a positive influence on accident prevention. It sharpens the desire for safety, shows how accidents occur, how to care for injuries, and focuses attention on many specific ways to avoid accidents. The more that is known about the injuries studied, the greater is the appreciation of what it means to suffer injury, and the safety program becomes more personal.

In the Bell System, 169,000 employees hold up-to-date first aid certificates and 5,900 more are instructors. Many of the people who received this training are using it actively in their own communities.

### *General Publicity*

TYPICAL OF THE OUTSTANDING MATERIAL that has been circulated systemwide and used advantageously in getting safety messages across are company magazine articles, booklets, and posters. When these are mailed to the home, they more surely "hit home," and so generate enthusiasm for preventing accidents within the family circle.

Much publicity material is contributed by the employees, as well as members of their families. Essay contests for school-age children were found to encourage a healthy interest in safety throughout employees' families.

### *Safety Committees*

While many things have been done to reduce so substantially the number of on-duty accidents, much of the improvement can be related directly to the work of safety committees.

Their objective is to focus accident prevention on the "whole" employee and motivate every individual in the group they represent. These groups exemplify

*Interdepartmental safety committee alerts employees for icy streets with this lobby display, as suggested in the film, "Charlie's Haunt."*

teamwork of the highest order. It was natural that they would be called on to assist with off-duty safety activities, because of their experience in helping to improve the on-duty performance.

### *Safety and the Individual Employee*

A FULL PROGRAM such as the one which this story describes is intended to reach all employees in a way that will best "bring home" the desire for safety at all times.

In an organization as complex as the telephone company, all employees and supervisors have many important activities that require attention from day to day. As a result, contacts concerning off-the-job safety are not the easiest thing to accomplish. Nevertheless, these contacts should and can be made.

Certainly the development of safety awareness is made easier if the new employee is introduced to safety as soon as he begins his career. The impressions developed during the first few weeks are often the more lasting.

During the last few years, the telephone companies have averaged some 150,000 new employees annually. A good plan is to learn, through modern interviewing techniques, just as much about the individual's past accident history as is possible, prior to employment. During indoctrination, the supervisor uses company equipment and surroundings as frames of reference to point out how to avoid accidents not only on duty but off duty as well.

IT IS GRATIFYING to be able to report that there is a widespread recognition of the problem, its size, its seriousness, and the

needs that exist. Also it is good to know that large numbers of telephone men and women at all levels, and in all sections of the country, are doing many things to keep themselves, their associates, and their families safe.

Preventing injuries is not only humane but sensible and economical. Experience indicates that it will reduce operating costs, improve public relations, enhance the employee's opinion of his company, and contribute to his security and welfare.

Furthermore, a full safety program demonstrates the Bell System's interest in the employee as an individual. His well-being is of paramount concern. Whether or not the employee is on the job at the time of the injury is unimportant. The ultimate objectives are for the employee to accept his full share of the responsibility for his own well-being, and that of his family and fellow workers; and to believe that "Safety in All Ways and at All Times" is a way of life, for every individual, in every department, in every telephone company in the Bell System.

*In the end, personal contacts and the integration of safety into the work day will bring about an attitude for safety that is a "way of life."*

*This pole is one of more than 21 million owned by the Bell System. It stands as mute evidence that rural areas are no longer isolated, but rather, that they are a constant part of the commerce of the nation and of the world.*

*Various methods of impregnating poles with preservative solutions add greatly to the serviceability of this important item of outside plant*

# PRESERVING THE LIFE OF SOUTHERN PINE POLES

ALLISON H. HEARN

OUTSIDE PLANT SECTION, ENGINEERING DEPARTMENT, A. T. & T. CO.

HAVE YOU EVER walked into your living room on a bright, warm spring morning and found the area about a window on the sunny side of the house crawling with winged "black ants" and myriads of cast off wings lying on the window sill and on the floor? If so, you have a termite problem.

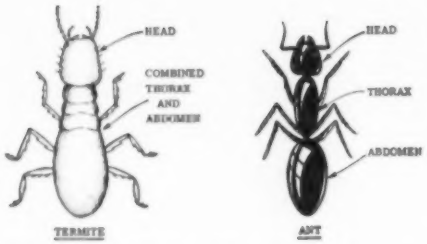
Termites are normally a wingless insect, dirty white in color, generally of the subterranean type and whose nest is deep in the ground. Their natural food is wood, although they will attack any material containing cellulose. Wood in contact with or set in the ground is particularly subject to attack unless protected with a wood preservative which is poisonous to termites. Under favorable circumstances termites will also attack wood which is not in contact with the ground. They are good engineers, and in dark, damp, poorly ventilated basements, under porches where air circulation is poor, or in hollow cinder block foundations they will build mud tunnels, often several feet in length, on the masonry surfaces to reach wood sills, beams, and flooring.

During most of the year a termite colony consists of a queen, workers, and soldiers. Usually once a year in the north and twice a year in the south certain individuals assume reproductive powers, turn black in color, grow wings, and swarm from the old nest to establish new colonies. It was these colonists you found in your living room.

Other insects which attack wood are carpenter bees and ants and the grubs or larvae of several species of beetles. Although they do extensive damage, they are not as prevalent in wood as are termites.

Another wood destroying agency, even more serious than termites and with which those of you living in the suburbs or country are undoubtedly familiar, is decay. Decay is caused by fungi, a low order of plants. The brackets and toadstools seen on the outside of decayed wood are the fruiting bodies, and bear the seeds of the fungus. Like the higher plants, fungi must have favorable moisture and temperature conditions for growth.

Decay may be found anywhere that moisture and temperature conditions are favor-




*It is easy to distinguish a termite from an ant. In termites the thorax and abdomen are combined so that there are only two segments; in ants the thorax and abdomen are separate so that there are always three segments.*

able. It is most prevalent and active, however, in wood in contact with the ground —such as the back porch steps, siding on the house or garage at ground level, and particularly in fence posts, clothes poles, and telephone poles, which are actually set in the ground.

Fortunately the toxic or wood preserving materials effective against rot or decay are also effective against termite or other insect attack. The converse is not always true. Wood preservatives are divided into two groups. These are (a) water borne salts, such as zinc chloride, Wolman salts, and greensalt; and (b) oil-type preservatives, such as coal tar creosote, pentachlorophenol solution in petroleum, or the new preservative, pentachlorophenol added to creosote, which tests by the Bell Telephone Laboratories show is more effective than either of the others. In general, the water borne preservatives are used to treat material which will be above ground or must be painted. The oil-type preservatives, as a rule, are more permanent and therefore more satisfactory for materials in contact with or set in the ground.

THE FIRST TELEPHONE WIRES were strung on chestnut and eastern white cedar poles. These species are naturally durable, that is, resistant to decay and termite attack. Untreated, they have an average life of 15 to 18 years. With the growth of the industry, the supply of chestnut and cedar was inadequate to meet the demand and it was necessary to find other species of timber suitable for use as poles. Because of its strength, straightness, and abundance, southern pine was a natural choice. It is not durable, however, and without preservative treatment would not last more than three or four years in the ground. But with proper preservative treatment, southern pine poles will have an average physical life of 35 years or more.

Since its introduction in the Washington-Norfolk line in 1897, the use of southern pine has increased tremendously. At the present time, of the more than 21 million poles owned by the Bell System and which represent an investment of about 1.2 billion dollars in pole plant, approximately 73 per cent are southern pine and over 80 per cent of our annual pole purchases are southern pine. The cost of individual poles is constantly increasing. For example, in 1928 the average price per pole was $6.60; in 1957 the average price was $18.66.

Poles set in the ground are very subject to decay and termite attack. Their preservative treatment, to insure adequate life and to minimize early failures due to deterioration, is of prime importance to the Bell System. The Bell Telephone Laboratories is continuously searching for better preservative materials and for better methods of obtaining the penetration and distribution of preservatives in the wood.

SOUTHERN PINE POLES are treated by a pressure process. Treatment is done in an airtight horizontal cylinder six to eight feet in diameter and 120 to 150 feet long, which will hold 150 to 200 average-size poles. The

poles are loaded on tram cars, the loaded cars are run into the cylinder on rails, and the door of the cylinder closed and bolted.

There are two basic methods of pressure treatment: the "full-cell" process and the "empty-cell" process. In making treatments with the full-cell process, a preliminary vacuum is first applied to remove the air from the wood cells. The preservative is then admitted without admitting air. After the cylinder is completely filled with preservative, pressure is applied until the required absorption is obtained. In the empty-cell process, air is forced into the treating cylinder before the preservative is admitted. The preservative is then forced into the cylinder, the air being allowed to escape at a rate such that the pressure remains constant until the cylinder is filled. This leaves the wood cells more or less impregnated with air under pressure. After the cylinder is filled with preservative, pressure is applied until the desired absorption has been attained. When pressure is released, the compressed air in the wood forces much of the absorbed preservative out of the wood, so that a greater volume may be injected originally for a given net retention than is the case with the full-cell process. The result is a deeper penetration and a more uniform distribution of the preservative in the poles.

From 1897 to the fall of 1929, southern pine poles were treated by the full-cell process with a minimum net retention of 12 pounds of creosote per cubic foot of wood. Because of the high rate of absorption of creosote during the filling period, the pressure period was usually of short duration and the maximum pressure only a few pounds. The results were a high concentration of the creosote in the outer sapwood, and shallow, irregular penetration in many of the poles.

Due to the high concentration in the outer sapwood, the poles were usually dripping creosote on removal from the cylinder, and continued to "bleed" long after installation. For the first quarter century, the use of creosoted southern pine poles was confined mainly to the south where the bleeding was accepted without complaint. In the 1920's, the use of southern pine spread to the north and middle

*Creosoted southern pine poles are removed from treating cylinder after pressure treatment.*

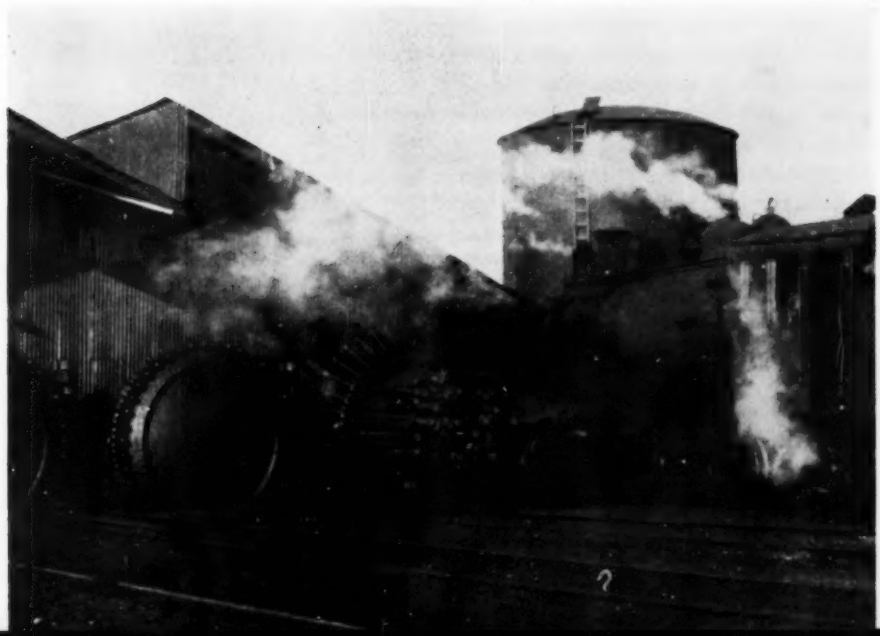


*Figure 1—decay in untreated sapwood of a 12-lb. full-cell creosoted southern pine pole.*

west. In these areas, accustomed to the clean, untreated above-ground portions of the chestnut and cedar poles, the bleeding was very objectionable. Also, as illustrated in Figure 1, the chief cause of early failure was decay in the untreated sapwood.

Because of these two objectionable features—bleeding, and decay in untreated sapwood—the Bell Laboratories conducted a study of the relative efficiency of the full-cell and empty-cell processes with respect to penetration and distribution. On the basis of the results of this study and of the inspection of 8-pound empty-cell treated poles in the lines of other utilities, the empty-cell process with initial air was adopted, in the fall of 1929, as the Bell System standard method for treating southern pine poles, and the required retention of creosote was reduced from 12 to 8 pounds per cubic foot of wood.

As was anticipated, the change to the 8-pound, empty-cell process was a forward step in the control of bleeding, and early failures because of decay in untreated sapwood are a rarity. However, because of the lower retention and the better dispersion of the creosote in the wood, the concentration of preservative in the outer sapwood is much reduced. As a result, the chief cause of early failures of the 8-pound empty-cell treated poles is, as shown in Figure 2, external decay at or below ground line in the outer sapwood.

In a recent inspection of several thousand poles of various age groups, located mainly in the south, failures because of decay were found in poles which had been in line 10 years or less; and on a cumulative basis 25 per cent of the poles had failed in 25 years or less. Not only is the replacement of these early failures costly, but decay of this type is a definite safety hazard. Generally located below ground line, it is not apparent unless the butt of the pole is excavated. While an increase in the amount of preservative retained would reduce the number of early failures, it is believed that an increase in retention would result in objectionable bleeding.

PENTACHLOROPHENOL - PETROLEUM SOLUTION was first used for the treatment of southern pine poles for System use in 1946

*Figure 2—external decay at ground line of an 8-lb. empty-cell creosoted southern pine pole.*

and 1947, when there was a critical shortage of preservatives. It was adopted as a Bell System standard preservative in 1951. To date, no instances of decay in penta treated poles in pole lines have been reported by the operating companies, although both decay and termite attack have been observed in pole-diameter posts installed in the Bell Laboratories' Orange Park, Florida, test plot.

Analysis for penta content and distribution in pole-diameter posts immediately after treatment and again two years after installation in the test plots have shown penta losses in the outer half inch of sapwood averaging 40 to 50 per cent of the original retention. Additional analyses after four years' exposure shows that the depletion is continuing but at a slower rate. If, because of the loss of penta, the concentration of residual penta falls below the minimum required to inhibit fungus growth (other conditions being favorable) decay is probable.

In general, penta-petroleum treated southern pine poles have been satisfactory for cleanliness and bleeding. Bleeding is fairly common soon after treatment, either at the producers' yards or after delivery. The bleeding is usually of transitory nature. The exudate is thin and either drips off on the ground or evaporates, leaving the poles with a shiny, varnished appearance. This bleeding does, however, represent a loss of preservative. Many penta treated poles in pole lines bleed at the ground line. The exudate, as illustrated in Figure 3, may be of sufficient quantity to saturate the soil for several feet from the pole, killing the grass around the pole. It has been necessary for this reason to replace some poles set in lawns or sidewalks. Also the exudate in the soil has caused insulation failures in buried wires brought up poles for repeaters or subscriber's drops.

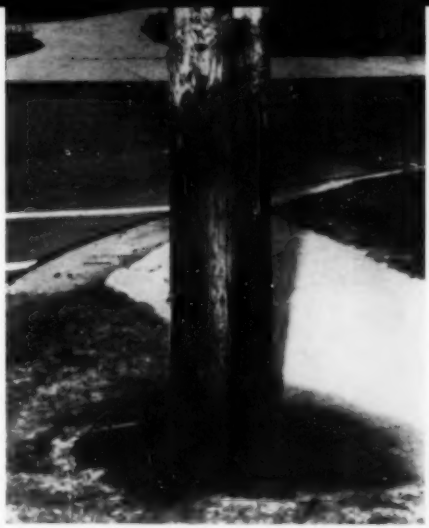


*Figure 3—ground line bleeding around a penta-petroleum treated southern pine pole.*

Penta-petroleum solution in common use is 5 per cent preservative and 95 per cent vehicle of little, if any, preservative value and most of which is lost by evaporation soon after treatment.

CREOSOTE IS AN EXCELLENT SOLVENT for penta. It is a good preservative when used in sufficient quantity and has a high distillation range, comparable to that which tests have shown desirable for petroleum solvents. It does not have the bleeding or sludging characteristics a petroleum in the same distillation range would have.

Laboratory bio-assay tests on treated, weathered blocks, using two of the most active organisms commonly found in decaying poles, show that creosote to which two per cent by weight of pentachlorophenol has been added is approximately 40 per cent more effective than either preservative alone. Experience with ¾-inch stakes in the test plots has corroborated the laboratory tests.

It has been found that, although the average retention under the empty-cell process was 8 pounds per cubic foot of wood, retentions in individual poles varied

*Laboratory bio-assay test determines the amount of preservative required to stop decay.*

from 2 to 14 pounds per cubic foot. The performance of creosoted posts in the Bell Laboratories' test plot at Gulfport, Miss., and of poles in test lines have shown that early failures occur in those poles whose retentions are in the lower part of the distribution range. Because of its greater preservative value, the combination preservative will eliminate many of these early failures.

Treatment with the new preservative was started on a limited scale in 1953, and because of the satisfactory results of the early treatments is now the only standard preservative for the treatment of southern pine poles for System use. The appearance of the creosote-penta treated poles is the same as that of poles treated with creosote alone. In color they range from brown to black depending on the creosote used and their seasoning. In general the surface condition of the poles has been satisfactory to the operating companies.

The cost of the creosote-penta solution is higher than either creosote alone or penta-petroleum solution at the same retentions per cubic foot of wood. A cost analysis, using present worth of annual charges, shows that we can afford the additional cost if only one half of the early failures found in the inspection previously mentioned are eliminated. There are also some intangible benefits to be derived. The initial inspection of poles in line may be deferred. Intervals between inspections may be increased. There is less likelihood of service interruptions because a decayed pole broke off during a storm, possibly taking several other poles with it. Also there is less likelihood of injury to a workman because the pole on which he was working had been weakened by decay.

TO GET BACK to the original problem: what do I do about the termites in the living room? How do I keep my fence posts from rotting off?

The termites in the living room came up through the basement floor, from the foundation, or unfortunately, from the sills or beams supporting the floor. In new construction, particularly in the south, it is advisable to use treated material in parts of the house that are subject to termite attack. In the house, where odor would be objectionable or in locations where the wood is to be painted, a salt preservative should be used. Either Wolman salts or chromated zinc chloride are suitable and are commonly available. For use in contact with the ground, creosote or penta-petroleum solution would be better.

Termites in houses may often be discouraged by saturating the soil around the

foundation with a 5 per cent penta-petroleum solution. This is done by digging a shallow V-shaped trench around the outside of the foundation and pouring the preservative in the trench. If the termites are working in the sills, which can be determined by sounding with a hammer and prodding with an ice pick, drill small holes at intervals and squirt the penta in with a pressure oil can. Also swab penta on the surfaces and in the joints.

Of course it is best to use treated wood for fence posts, arbors, or any material in contact with the ground. If treated wood is not available, it is well to soak the portion which will be in the ground in a penta solution. Painting or swabbing preservative on the wood will do some good. Repeated applications are more effective than a single application. The preservative must be in the wood. The life of fence posts may be prolonged by pouring preservative around the ground line. Dig a V-shaped trench to keep the preservative near the post.

Penta may be purchased at hardware stores or lumber yards under a variety of trade names. It is available ready for use or in concentrated solution. If in concentrated form, dilute it according to the instructions on the can. If it is to be used indoors, and particularly where it is to be painted over, dilute with sub-turpentine, varsol, or some other commercial solvent. For general use, fuel oil is a good solvent. For fence posts or other uses where appearance is not important, dilute with used crank case oil.

A word of caution about buying treated material: be sure the preservative used, the method of treatment, and the penetration and retention of preservative conform to the requirements of the American Wood-Preservers' Association.

*Bell Laboratories' Gulfport, Miss., test plot has ¾-inch square stakes used for accelerated tests in foreground, poles and pole-sized 10-foot posts used for long time tests are in background.*

## Who's Who & What's What

*(Continued from page 3)*

*John M. Shaw*

had gone to Washington; this issue's final article was written at the editor's insistence that Mr. Shaw, always an independent thinker, attempt to evaluate the changes that have come about during his tenure —if not his own part in them. As a boy Mr. Shaw came to this country from his native Scotland. He was only 14 when he first went to work, but he continued his education and attended night courses at the University of Pennsylvania. He worked in several public utilities before he joined the then Information Department of A. T. & T. in 1930. The next year he went to Washington as general information manager of The Chesapeake and Potomac Telephone Companies. Five years later he was named assistant vice president in the Public Relations Department of the New York Telephone Company. Returning to A. T. & T. in 1944 as assistant vice president in the Public Relations Department, Mr. Shaw had charge, at one time or other, of all the varied activities of that department. He was named assistant vice president of the Merchandising (now Marketing) Department when the new department was created in 1955. "Learning What Telephone Service People Will Need" in the Winter 1955 issue of this MAGAZINE, was his most recent contribution.

MARGUERITE E. MCCABE joined the Traffic Department of the New York Telephone Company in Westchester in 1939. She filled various assignments and was an assistant chief operator in charge of training in the White Plains office. In 1950 she moved to the traffic division of the Operation and Engineering Department of the American Telephone and Telegraph Company. Promotion of safety, both on and off the job, and among women employees in particular, is her principal responsibility. At 195, Miss McCabe is chairman of the Operations Department's Safety Committee, and represents this department on the General Departments' Safety Committee. She has participated in local and national safety councils, and for a number of years has been a member of the American Society of Safety Engineers. She is presently a member of the women's activities committee of the National Safety Council.

*Marguerite E. McCabe*

*Dorris W. Fauber*

STARTING his telephone career in 1946 as a lineman with The Chesapeake and Potomac Telephone Company of Virginia in Lynchburg, DORRIS W. FAUBER later became line foreman. In turn he was service foreman, plant wire chief, then foreman supervisor—building, supplies and motor equipment. In 1955 he went to Richmond as plant safety supervisor for the Virginia company. Last year he came to A. T. & T. to work on special safety projects in the Operation and Engineering Department's plant division. He is an engineer in the safety group.

ALLISON H. HEARN, who has a B.S. in forestry from New York State College of Forestry, joined the Bell Telephone Laboratories in 1928 as a member of the timber products group of the outside plant department. He worked on insulated wires and special wires and cables for the Armed Forces at Point Breeze during World War II. He continued his work at the Labs until 1957 when he transferred to the Operation and Engineering Department of the American Telephone and Telegraph Company. He is an engineer in the plant structures group of the outside plant section. Mr. Hearn is chairman of the pole service records committee and a member of the uniform recording of service records committee and of the treatment of pine poles committee of the American Wood-Preservers Association. He is also secretary of the Bell System and Edison Electric Institute joint committee on stabilization of unguyed poles. In addition, Mr. Hearn is a member of the wood poles committee of the American Standards Association and of the subcommittee on strength and loading for the revision of the National Electrical Safety Code. He is also on the timber products committee of the American Society of Testing Materials.

*Allison H. Hearn*

# HEADQUARTERS SUMMARY

March 15, 1959, to June 15, 1959

SUBSTANTIAL ECONOMIES have been realized by the use of PIC cable and ready access terminals in building installations. In some instances, however, the Companies have been handicapped because the National Electric Code specifies that cables used for vertical runs must have a fire-resistant sheath unless encased in non-combustible conduit or located in a fireproof shaft with fire stops at each floor.

To overcome this, a PIC cable with lead sheath has been made available.

NEW YORK'S sidewalk superintendents gained new status when Western Electric installed fifteen telephones in three colors for their special use at the construction site of its new office building, Broadway and Fulton Streets.

The telephones, within handy reach at a special observation post, give a running account of the work in progress. Superintendents with the urge to issue orders by telephone are welcome to do so. (Nobody will be listening, of course.) The report is delivered by a dulcet voiced telephone lady from an endless tape recording, which is changed frequently to keep pace with the construction.

The spoken messages are supplemented by displays, also located at the site, which show how the building's foundation is being tied into the bedrock of Manhattan, a model of the completed structure and related information of interest to sidewalk superintendents under whose scrutiny all local structures reach completion.

THE BELL SYSTEM is moving ahead in a program to increase the capacity of certain radio relay routes. A new high-capacity radio relay system called TH, for example, is being superimposed over the existing (TD-2) facilities between Denver and Salt Lake City. Long Lines is now making additions to the buildings at 16 radio relay stations on this route and installing more carrier equipment at the terminals—work which will eliminate the need for constructing a totally new route along the difficult terrain between these two points. New horn reflector type antennas which can transmit and receive in several frequency bands simultaneously will also replace the existing so-called delay lens antennas. These new antennas make it possible for the TD-2 and TH systems to operate without interference over the same route.

In the initial installation of TH facilities, five channels will be provided—two for telephone, two for protection and one for television service. A TH system fully equipped for telephone service would be capable of carrying about 11,000 telephone conversations.

ANNOUNCEMENT of a new Bell Laboratories building to be constructed at Holmdel, N. J., calls to mind the many important radio developments that have originated at this site. It was here that K. G. Jansky, while studying radio noise, discovered extra-terrestrial radiation and thus laid the foundations for radio astronomy. Holmdel is also the site of important work on rhombic antennas, waveguide transmission and radar. In addition, much of the basic research on radio relay microwave systems was carried out here, leading to today's transcontinental radio systems for telephone messages and television. The new building, scheduled for completion by late 1961, will considerably strengthen the Bell Laboratories' role in carrying out Bell System research and development programs.

MATERIALS for modern electronic devices must often be prepared in ultra-pure form. For this reason, Bell Laboratories has devoted considerable effort to purifying the semiconductor materials used in transistors, for example, and has recently devised a further improvement in refining technique. To avoid contaminating a material with a crucible, a "floating-zone" method was developed some time ago, by which a small zone is melted in a vertical rod. With this method, the molten material is in contact only with the solid material above and below, and is held in place by surface tension. Applications were limited to rods of small diameter, however, until recent work showed how greater cross-sections of material could be purified in a floating-zone refiner. Instead of using rods, Bell Laboratories researchers fashion specially shaped flat plates or tubes. A cross-section of one square inch, extremely difficult to handle by the previous technique, can now be zone refined when the material is prepared as a tube two inches in diameter with walls one-eighth inch thick. The larger volumes of purified materials should greatly aid in designing high-performance devices.

ROCKET FIRINGS at Cape Canaveral have demonstrated the accuracy of a new missile-guidance system developed at Bell Laboratories. Twice in recent months, THOR-*Able* II missiles have been guided by the new system with such accuracy that the nose cones were rapidly recovered after flights of about 5,000 miles over the South Atlantic. Although the tests were conducted with the THOR-*Able* type rockets, the guidance system was designed for the first squadrons of the TITAN ICBM. Using a combination of radio and inertial guidance principles, the system was developed by the Laboratories for the Air Force Ballistic Missile Division. Remington Rand-Univac developed the computer used with the system.

FORTY-SEVEN young engineers from eighteen Operating Companies and Long Lines were recently graduated from the Operating Engineers Training Program (O.E.T.P.) at Bell Laboratories. This was the second group to complete the two-year course in the advanced electronics that will have an important influence on modern telephone systems. During the program, the engineers devote part of their time to classroom studies, and also participate in actual work assignments at the Laboratories. A third group of Operating Company engineers will be graduated in 1960, and a fourth class will enter the program this August.

THE U.S. AIR FORCE has named Western Electric prime contractor for a project to extend the DEW (Distant Early Warning) Line eastward across the icecap of Greenland. Meanwhile, thousands of miles to the west, another major link in the nation's radar defense network—the DEW Line's Aleutian Segment—has been turned over to the Air Force and is now in operation.

"DEW East," as the eastern addition is called, will extend from the end of the original Line on Baffin Island to a station on the west coast of Greenland, thence through two stations on the wind-swept icecap itself, to a site on the island's east coast. A communications link will extend across the Denmark Strait to the northwest coast of Iceland. Providing further protection for the eastern flank of the United States and Canada, "DEW East" will be equipped with radar detection and communication systems comparable to those now in use on the main DEW Line.

The DEW Line itself—stretching some 3,000 miles across the Arctic from northeast Alaska to Baffin Island—was turned over to the Air Force by W.E. in 1957.

As prime contractor for "DEW East," W.E. will assume management of the communications and electronic phases of the project, including responsibility for engineering, procurement, logistical support, installation and testing. Construction of buildings has been assigned to the U.S. Army Corps of Engineers.

Plans for two of the detection stations atop the Greenland icecap have required the pioneering of new building techniques. Nearly two miles thick and covering most of the island, the glacial ice is always shifting—it constantly sinks, due to the weight of new snows, and moves horizontally as well. Construction problems stemming from this will be solved by placing the communications and radar antennas on buildings mounted on adjustable pedestals, enabling them to be realigned periodically.

Western Electric also was the U.S. Air Force prime contractor for the completed Aleutian Segment, which was turned over on May 1 in a ceremony at Anchorage, Alaska. Extending over a thousand miles westward from Alaska out into the bleak Bering Sea, the segment provides the U.S. and Canada with radar warning against enemy aircraft attempting an "end run" around the western flank of the main DEW Line.

DECISIONS have been made to go ahead in 1960 and 1961 with System trials of large scale transistorized electronic computers for several of our more important data processing jobs. This puts us on the threshold of a new era in how we accomplish many of our operating tasks.

Intelligent and imaginative study will undoubtedly turn up many areas where high-speed computers can help managers in all departments get more complete and accurate information sooner than they are now getting it, and at less cost. The big job ahead is to find out how best to exploit these tools' tremendous capacity for work. This will require interdepartmental participation with high level direction and encouragement throughout the System.

The Companies have been urged to review their present status and future plans in this field to insure realization of maximum cost savings and service advantages in all departments from presently available data processing equipment, and being ready for large scale computer operation when such machines become available.

PRODUCTION of the Bell System's new small telephone started in June. With the help of customers, it has been named "The Princess," this name having tested high throughout four separate surveys. Customers associated it with something small, elegant, beautiful and decorative.

"The Princess" will have a dial-night light as a standard feature, but will not have a built-in ringer. Instead, a new separately-mounted combined connecting block and ringer will be used with it. Transmissionwise, "The Princess" is equivalent to the present 500-type sets.

It will be produced in four of the present standard colors—white, beige, pink, blue—and in turquoise, a new color. There is also possibility of later furnishing the set in gold too, if the problems associated with molding plastics with metallic powders can be overcome.

To determine Systemwide market potential and test the effectiveness of the marketing program, "The Princess" will be introduced initially this September in four "reconnaissance" areas—Colorado, Georgia, most of Illinois State Area and the Central Area of Pennsylvania. A marketing program will be provided for introduction of the sets in these areas. Sales results for the selected areas will have been evaluated and a Systemwide marketing program finalized by the end of 1959. Systemwide launching of "The Princess" will then be set, depending on close coordination of production and shipping levels with potential sales.

INFORMATION operators sometimes have such a large number of directory pages to consult, that a simplification of their tasks will undoubtedly become necessary. To test one method of reducing directory information to a more convenient and compact form, the Bell Laboratories has conducted a preliminary trial in New York City and a more extensive trial in Washington, D. C. In these tests, directory pages are photographically reduced to a microprint only about

one inch square. Up to 28 microprint pages appear on a single card about 7 inches wide and about 6 inches high. Key letters on the back of a card and a tab at the top assist the operator in quickly finding the one containing the desired page. She then places the card in a specially designed reader—which looks something like a microfilm reader—and after positioning the card in a holder, sees the page displayed on a screen larger than actual size. The trials have produced much useful data, but the microprint card method may not be the final solution. Microfilm and electronic storage methods are also possibilities for which additional testing may be necessary.

STEREOPHONIC SOUND transmission is of increasing interest to radio and TV broadcasters (see Headquarters Summary in Winter, 1958-59, issue). One of the difficulties, however, is to broadcast stereophonically and still deliver a program acceptable to the listener who is receiving it in non-stereo form on a single radio or TV set. Consequently, broadcasters have had to "dilute" the stereo, so that the program is not completely satisfactory to either the stereo or non-stereo listener. To solve this problem, Bell Laboratories researchers have demonstrated a "compatible" system using a "precedence" effect. If the sound emerges from one loudspeaker, and also is delivered from a second loudspeaker but is delayed by several thousandths of a second, the listener "hears" the sound only from the first. In this way, sound is "separated" according to the positions of the microphones picking up the program in the studio. Yet the single-channel listener hears the total sound, not distorted from the "left" or "right."

A CARD-OPERATED REPERTORY dialer is to be product-tested this fall. Unlike other repertory dialers under study, this dialer does not contain a memory device for storing telephone numbers to be dialed. Each telephone number is coded on a punched plastic card which may be stored in a convenient container (perhaps part of the dialer housing) and each customer may provide as many telephone numbers as he desires.

The cards, approximately 2⅝ inches wide and 3⅛ inches long, are so arranged that the customer can "code" a desired number by punching holes in a blank card with the point of a pencil.

When the customer wishes to dial a number, he selects the appropriate card and inserts it in a slot in the dialer. He then lifts the telephone receiver and when dial tone is heard, depresses the "start" bar. The dialer translates the holes on the card into dial pulses which are sent to the central office. The dialer is operated mechanically by self-contained spring motors which are energized by inserting the plastic card in the slot. All electrical power required during the dialing operation is taken from the telephone line.

EXPERIENCE obtained with the Personal Signaling Systems now operating in Allentown-Bethlehem, Pennsylvania, and Columbus, Ohio, indicates good customer acceptance of the service and the practicability of the pocket-size selective signaling radio receivers.

This new development in the telephone art is consistent with one of the basic objectives in furnishing complete telephone service, i.e., making certain that the maximum number of calls is completed.

# The Blue Pencil

THE AIM AND PURPOSE of the telephone service is not only to serve but to please the customer. Everything must be subordinated and surrendered to that aim.

Scientific advances are making possible the most sweeping and radical changes in telephone history. These match the electronic age in which we live. Much will always remain to be done, but technically our course is charted for years ahead.

Scientific progress by itself is not enough. What really counts is the spirit of the men and women behind the machines. Machines must be servants, not masters.

Our telephone service must be a personal service to meet the customers' wishes. We must study their wishes all the time. We must then satisfy them by a service which is courteous, pleasing, and speedy.

To that end all our thinking, training, procedures, and organization will be directed—in every department and at every level. And we must act boldly. We must not be paralysed by precedent or inhibited by fear of error. If we try and fail, we shall be forgiven. If we do not try, we shall be condemned—and rightly so.

But success will elude us unless we are a united, determined, and dedicated team, with management and staff moving in harmony.

Finally, we must never forget we are a monopoly. We do not face the challenge of competition. So we inherit special responsibilities to the community. We must not fail them. Let our purpose be to give the finest and most courteous service in the world. And let it be seen that we have this daily sense of purpose.

• • •

That statement of dedication and purpose is from the British *Post Office Magazine*—the telephone service in Great Britain being a part of that organization. In poster size it is displayed in places where telephone people work, and copies of it on small cards have been issued to all of them.

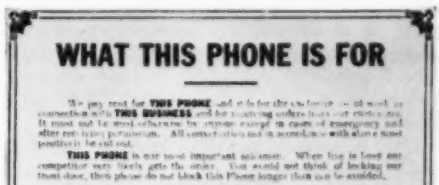
If it sounds remarkably like what we might say under similar circumstances, there is a reason. The British are introducing the dialing of trunk calls, corresponding to our own Direct Distance Dialing – DDD – and last fall took an important preliminary step. Let the *Post Office Magazine* tell the rest of the story:

"Telephone administrations the world over learn from each other, and on this aspect the Postmaster General felt we could with advantage study experience in the U. S. A. So in November he sent a team, representative of management and trade unions, to America to study telephone systems . . .

"They found that in many ways our practices compare well with those in the Bell system. But there were major differences, particularly in relations with customers, between the two systems. We can do no better than quote Nan Whitelaw, who says: 'The courteous and pleasing service given in the U. S. A. is a strong tradition over there and is one of the biggest assets in mechanization. The Americans appreciate, as we must do too, that extended dialling means that the telephone users will be looking to the operator for assistance when in difficulty and irritated. We must therefore bring our customers to realize that we are not only able to help but are ready and willing to do so.

" 'In the months ahead, there will be a great deal of attention focussed on the telephone service to see whether we are achieving our objectives which are now being stated. In no sense can this be done without full co-operation of the telephonists at the switchboards of every telephone exchange in the country, large and small, manual or auto-manual.

" 'I would emphasize that it is in our own interest to make our service a friendly one and to encourage a community spirit between ourselves and our customers. From all points of view, it is much easier to work with and for customers who like us.' "



**WHAT THIS PHONE IS FOR**

**OUTSIDERS**

**WHEN CALLING CENTRAL**

THAT BUSINESS MEN appreciated the value of the telephone while it was still a fairly new

business tool—late in the last century, when the telephone was scarcely more than 20 years old—is shown by a card of instructions which turned up in Canada recently. It was tacked up beside the telephone about 60 years ago in the London, Ont., business establishment of Mr. A. J. Morgan, who is now retired, and proved so successful that he printed copies for sale to others. The top of the card is reproduced here, and its sound advice—much of it still pertinent—is reprinted in part below:

WHAT THIS PHONE IS FOR

We pay rent for THIS PHONE and it is for the exclusive use of work in connection with THIS BUSINESS and for receiving orders from our customers. It must not be used otherwise by anyone except in cases of emergency and after receiving permission. All conversation not in accordance with above must positively be cut out.

THIS PHONE is our most important salesman. When line is busy our competitor very likely gets the order. You would not think of locking our front door, then please do not block this Phone longer than can be avoided.

WHEN CALLING CENTRAL

Be sure you have the right number. DO NOT guess at it.

Face the transmitter with mouth about one inch from the opening.

Speak clearly and distinctly. DO NOT SHOUT.

WHEN ANSWERING CALLS

Answer calls promptly. Do not say "hello" or "yes" it means nothing but answer distinctly the FIRM'S NAME. This saves time.

Face the Transmitter. Do not turn your head to one side and expect clear conversation.

IF IT IS AN ORDER be sure you get the name and address correct, then REPEAT IT. This is important as a wrong address or name causes delay, costs us money and drives our customers away.

Talk pleasantly. Let them know we appreciate their order.

Introduce new lines. Encourage Phone orders. Say thank you.

Wait until customer has hung up receiver before you cut off. It is very provoking when you cut off too short and customer has omitted something.

If party called for is not in ask if someone else will do, if not, then get their name and Phone Number.

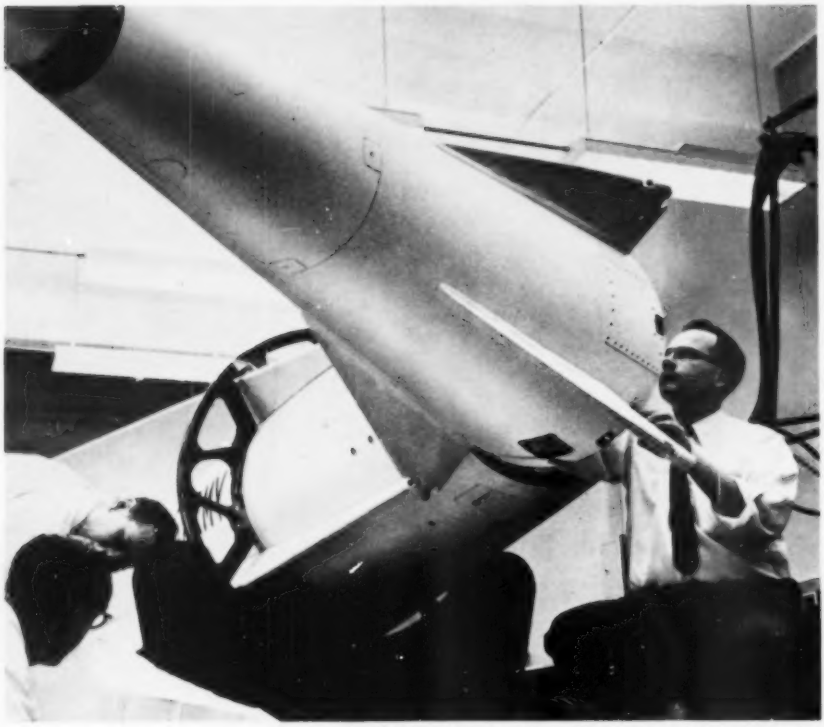
AGAIN OUR COVER ARTIST is Charles Mazoujian who has created several of our previous covers. In fact, he's the artist who did the cover for our last issue.

You may have seen his animal paintings in the new picture encyclopedia, "Pictorial Library of Pets, Plants and Animals." He has also illustrated several books for Random House including "The Story of the United States Marines," "The Barbary Pirates" and "Guadalcanal Diary."

HOW DO YOU like this MAGAZINE? Do you find successive issues interesting, informative, useful—or not?

These questions are always of utmost concern to the editor—and particularly now, when a System-wide survey of the MAGAZINE is being undertaken to find out the answers to these and other questions. The facts will be found—but they will be entirely impersonal, as statistical interpretations necessarily are. And of course we shall be glad to have them and be guided by them.

But there is another side to editing—the human, personal side. Any reader who will take the time to write directly to the editor to say, freely and informally, what he thinks of this publication—what he likes and doesn't like about it, what there might well be more of or less of, and anything else that's on his mind—will be doing a courtesy and a favor. And he will get a personal reply—and the editor's thanks. JSB



Bell Telephone scientists working on Nike-Hercules missile guidance system.

# Where do guided missiles get their "BRAINS"?

**Bell System-designed guidance systems give pinpoint accuracy to many of the nation's missiles**

Because of our experience with complex communications systems, we were asked, in 1945, to study the problems of creating guided missiles. The result was Nike-Ajax, the first successful guided missile for defending the nation against attacking aircraft.

Next came Nike-Hercules, America's newest surface-to-air guided missile (shown in laboratory above), which has already demonstrated its ability to destroy supersonic targets flying faster than 1500 miles an hour.

Under development is Nike-Zeus, designed to intercept and destroy enemy missiles that would be approaching us at fantastic speeds.

In addition, a radio-inertial guidance system for the Titan intercontinental ballistic missile is being developed by the Bell System. In a recent test of this guidance system, a missile nose cone was recovered in the South Atlantic only hours after firing from Cape Canaveral, Florida, 5000 miles away.

We are proud that our experience in communications serves the nation's defense. That experience, plus continuing research and development, is also at work every day improving telephone service.

**BELL TELEPHONE SYSTEM**